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# **COMMODORE**

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## **1802** COLOR MONITOR

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# **Technical Manual**

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5/87

## Materials for 1802 Manual

o NTSC AC : 120V 60Hz 0.8A 60W

o PAL AC : 220V 50Hz 60W

o Features (compared with 1702)

1) Additional Switches : Video, Audio I & II, Monochrome

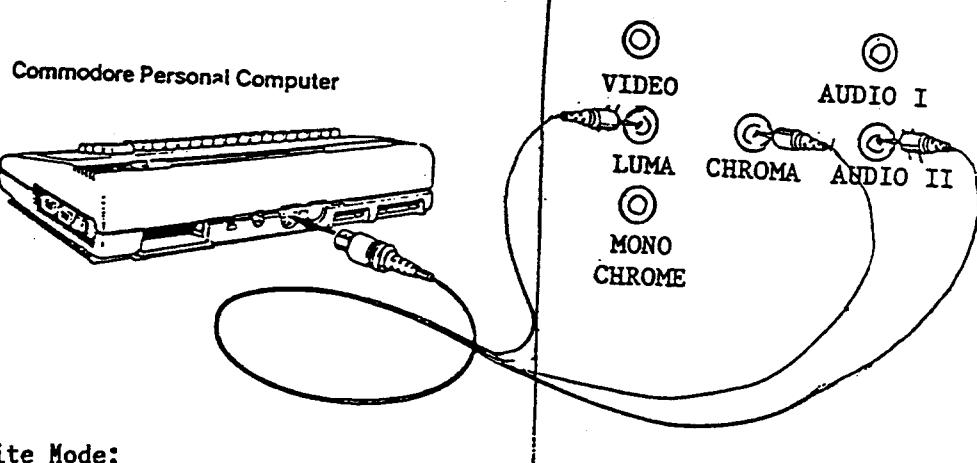
2) 40-column Monitor : 40 characters x 25 lines  
(8 x 8 dots)

3) 3-mode Video Select Switch:

1. Composite --- For VTR, TV tuner, home computer, etc.
2. Separate --- For C64, C128 and TED series
3. Monochrome --- For home business computer  
(Green screen display to protect eyes)

The figure below is an example of connecting a three-jack cable to the rear panel.

a) separate Mode:



b) Composite Mode:

Connect the cable to VIDEO and AUDIO I.

c) Monochrome Mode:

Connect the cable to MONOCHROME and AUDIO II.

The jack end of the cable can be plugged into the CHROM socket in any mode.

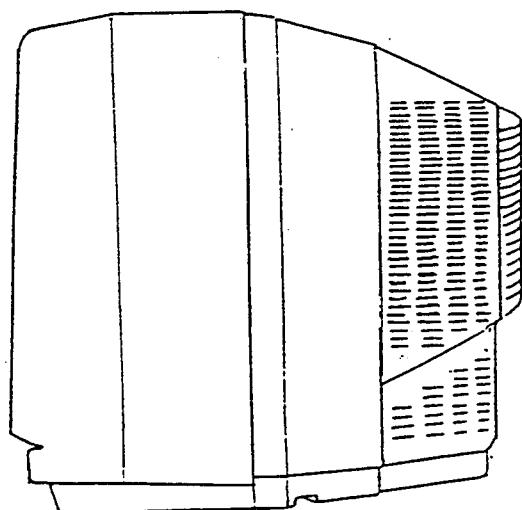
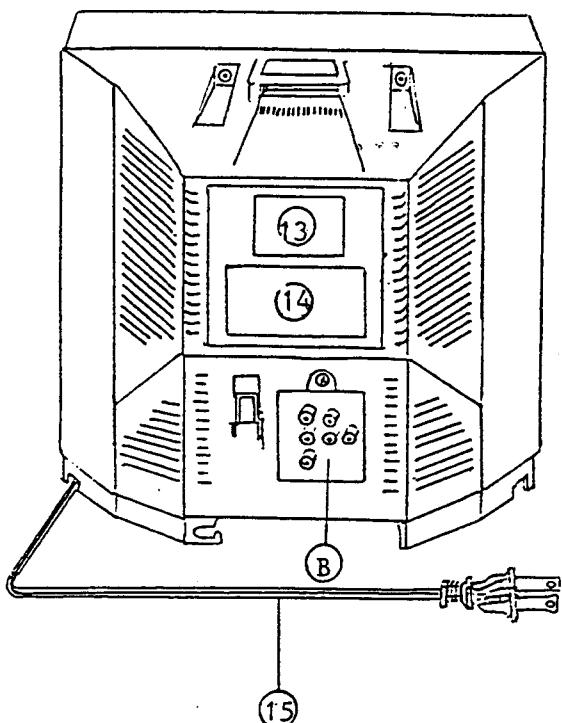
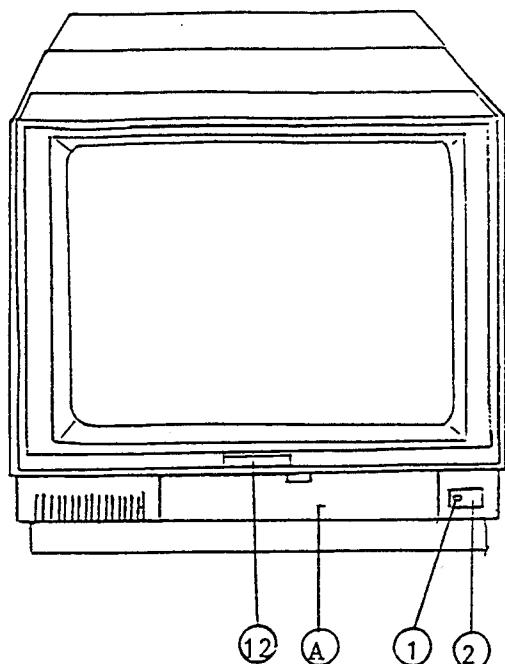
NOTE: Mode is selected with the 3-mode Video Select Switch on the front control panel.

Name	Description
① POWER INDICATOR	---
② POWER BUTTON	ON/OFF
Ⓐ FRONT CONTROL PANEL	---
③ VOLUME	Manual control knob
④ VIDEO MODE SWITCH	3-position slide switch
⑤ TINT	Manual control knob
⑥ COLOR	Manual control knob
⑦ CONTRAST	Manual control knob
⑧ BRIGHT.	Manual control knob
⑨ V-HEIG	Manual control knob
⑩ H-POSI	Manual control knob
⑪ V-HOLD	Manual control knob
Ⓑ REAR PANEL	---
VIDEO (YELLOW)	Input jack
AUDIO I (WHITE)	Input jack
LUMA (YELLOW)	Input jack
CHROMA (RED)	Input jack
AUDIO II (WHITE)	Input jack
MONOCHROME (YELLOW)	Input jack
⑫ NAMEPLATE	---
⑬ WARRANTY (MOLD)	---
⑭ RATING LABEL	---
⑮ POWER CORD	---

NOTES: ⑨ V-HEIG = VERTICAL HEIGHT

⑩ H-POSI = HORIZONTAL POSITION

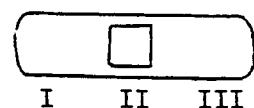
⑪ V-HOLD = VERTICAL HOLD



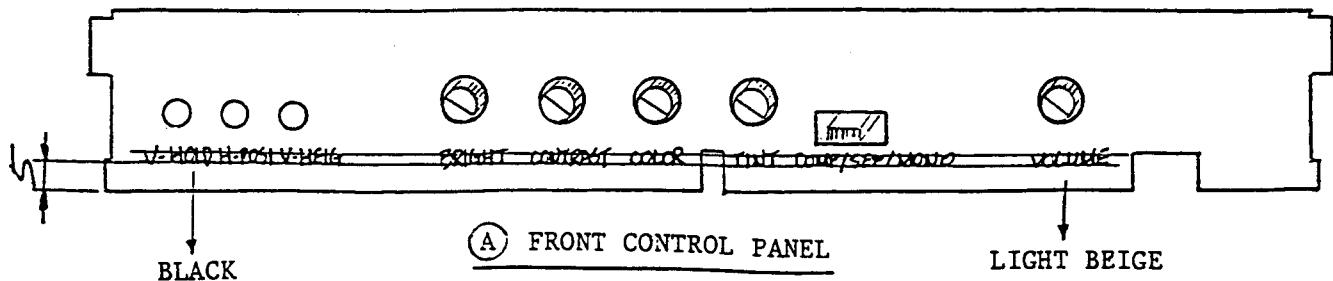
④ VIDEO MODE SWITCH

COLOR

COMP	SEP	MONO CHROME
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B <u>REAR PANEL</u>		
I	VIDEO	AUDIO I
II	LUMA	CHROMA
III	MONO	CHROME



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## SPECIFICATIONS

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<b>CRT:</b>	13V inch 90' in-line, Vertical Stripe Phosphor 0.62mm pitch, gray face.
<b>Input Signals:</b>	PAL Composite, Separated video (luma & chroma), Monochrome video, Audio I, Audio II.
<b>Input level</b>	Comp., Video, Chroma; Mono; 1Vp.p/75
<b>Display size:</b>	247(H)×160(V) mm
<b>Colors:</b>	Comp.; Full colors
<b>Resolution:</b>	Comp.; 1,000 characters (40 column×25 lines)

<b>Video band width:</b>	Composite; 3.5MHz Seprated video (luma & Chroma); 4.2 MHz Mono video; 4.2 MHz
<b>Scanning frequency:</b>	Horizontal; 15.625 KHz Vertical; 50 Hz
<b>Audio:</b>	Input; 1Vpp/47K Output; 1W
<b>Dimensions:</b>	356(W)×380(D)×391(H) mm
<b>Weight:</b>	Approx. 12 Kg
<b>Power input:</b>	220 VAC, 50 Hz
<b>Power consumption:</b>	65W

*\*Design, features and specifications are subject to change without notice.*

# IMPORTANT SERVICE SAFETY INFORMATION

## WARNING:

An isolation transformer must be used between the AC supply and the AC plug of the color monitor before servicing or testing is performed on this monitor, since part of the chassis and the heat-sink are directly connected to one side of the AC line which could present a shock hazard. The chassis of the monitor should never be connected ground.

Before servicing is performed, read all the precautions labelled on the CRT, chassis, and on the inside of the cabinet of this monitor.

## X-RAY RADIATION WARNING NOTICE

**WARNING:** PARTS WHICH INFLUENCE X-RAY RADIATION IN HORIZONTAL DEFLECTION. HIGH VOLTAGE CIRCUITS AND PICTURE TUBE, ETC., ARE INDICATED BY (★) IN THE PARTS LIST FOR REPLACEMENT PURPOSES. USE ONLY THE TYPE SHOWN IN THE PARTS LIST.

## PRODUCT SAFETY NOTICE

**WARNING:** FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER RECOMMENDED PARTS. THESE PARTS ARE IDENTIFIED BY SHADING AND BY (▲) ON THE SCHEMATIC DIAGRAM.

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## NOTICE D'AVERTISSEMENT DE RADIATION AUX RAYONS X

**AVERTISSEMENT:** LES PIECES QUI INFLUENT LES RAYONS X AU COURS DE LA DEVIATION HORIZONTALE, LES CIRCUITS A HAUTE TENSION ET LE TUBE-IMAGE, ETC. SONT ACCOMPAGNEES D'UN ASTERIQUE(★) DANS LE CATALOGUE DE PIECES DETACHEES. DANS LE CAS D'UN REMPLACEMENT, UTILISER UNIQUEMENT LES MODELES DE PIECES INDIQUES DANS LE CATALOGUE DE PIECES DETACHEES.

## NOTICE DE SECURITE

**AVERTISSEMENT:** POUR ETRE ASSURE D'UNE SEOURI OPTIMENT A TOUT MOMENT, REMPLACER LES COMPOSANTS CRITIQUES UNIQUEMENT PAR LES PIECES RECOMMANDÉES PAR LE FABRICANT DE L'APPAREIL, CES PIECES SONT IDENTIFIÉES PAR UNE ZONE D'OMBRE FT PAR LE SYMBOLE (▲) SUR LE SCHEMA DE MONTAGE.

The manufacturer's warranty and liabilities will be void if any unauthorized modifications, alterations or additions are made. For replacement purposes, use the same type or specified type of wire and cable, ensuring that the positioning of the wires is followed (especially for H.V. and power supply circuits). Use of alternative wiring or positioning could result in damage to the set or in a shock or fire hazard.

The picture tube used in this monitor employs integral implosion protection and should be replaced with the tube of the same type number for continued safety.

When handling the CRT, shatter-proof goggles must be worn after completely discharging the high voltage circuit.

Do not lift the picture tube by the neck.

## SAFETY PRECAUTION

1. Potentials as high as 24,000 volts are present when the monitor is operating. Operation of the monitor outside the cabinet or with the back board removed invokes a shock hazard from the monitor.
2. Servicing should not be attempted by anyone who is not thoroughly familiar with the precautions necessary when working on high-voltage equipment.
3. Always discharge the picture tube to the monitor chassis to keep off the shock hazard before removing the anode cap.
4. Perfectly discharge the high potential of the picture tube before handling the tube. The picture tube is highly evacuated and if broken, glass fragments will be violently expelled.
5. If any FUSE in this monitor is blown, replace it with FUSE specified in the chassis parts list.
6. When replacing a high wattage resistor (oxide metal film resistor) in circuit board, keep the resistor 10mm away from circuit board.
7. Keep wires away from high voltage or high temperature components.
8. This monitor must operate under AC220 volts, 50Hz, NEVER connect to DC supply or any other power or frequency.

# INSTALLATION AND CHASSIS PARTS LOCATION

## INSTALLATION OF THIS COLOR MONITOR CHASSIS AND INITIAL CHECK POINTS

When installing this color monitor chassis, first check operation on a black and white telecast. Check and if necessary, adjust centering, size, and focus. Observe the picture for proper black and white reproduction (tracking) over all areas of the screen. No objectionable color shading or fringing should be evident. If shading or fringing is evident, degauss the monitor.

In most instances after installation, a technician need only degauss the faceplate area and touch-up the static (center) convergence.

## CHASSIS PARTS LOCATION

The degaussing coil should be moved slowly around the front faceplate of the picture tube and around the sides and front of the monitor. The coil should then be withdrawn slowly to a distance of at least six to ten feet before disconnecting from the AC supply.

This monitor chassis is equipped with an automatic degaussing circuit which effectively demagnetizes the faceplate each time the monitor is switched ON after having been OFF for at least ten minutes.

**Note:**

See 'SERVICE ADJUSTMENT' on page 12 for details of adjusting procedures.

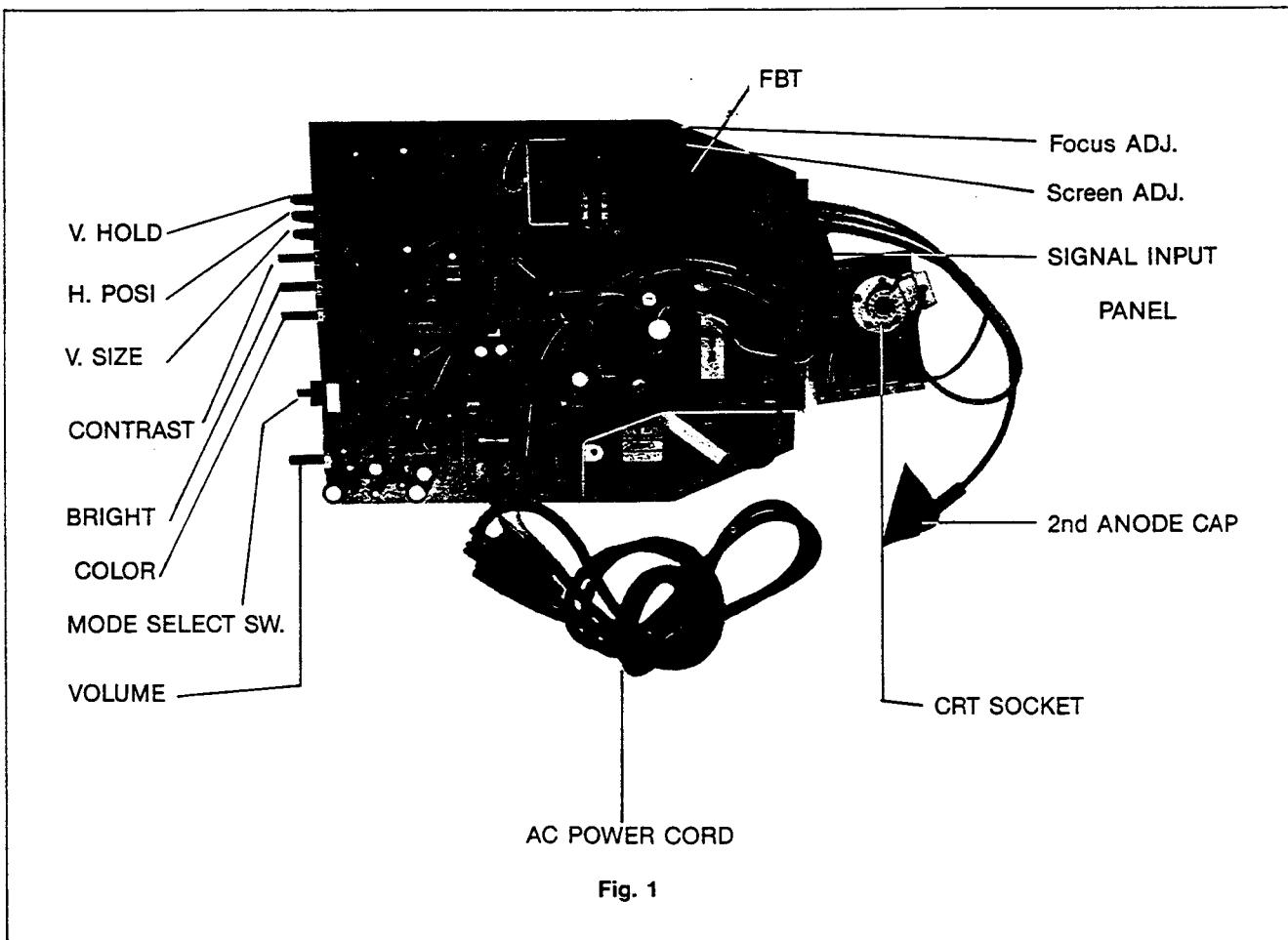
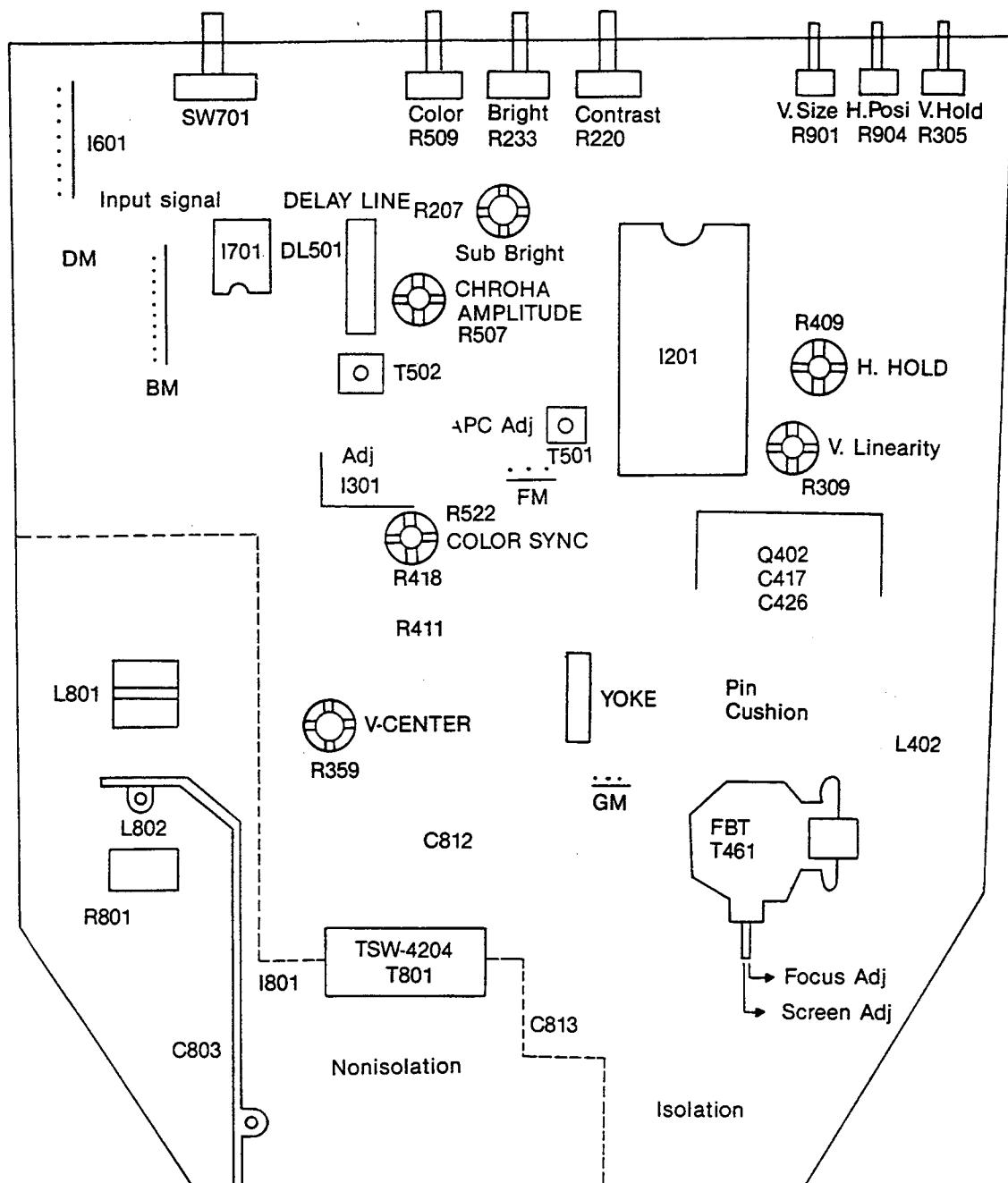


Fig. 1



(CM-146 MAIN BOARD)

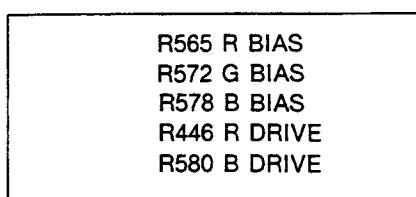
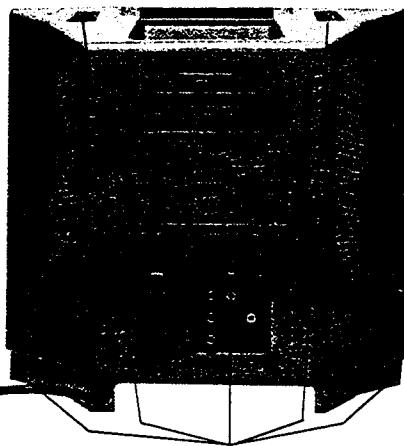


Fig. 2

# SERVICE INSTRUCTIONS

## CHASSIS REMOVAL (SEE FIGS. 3/4)

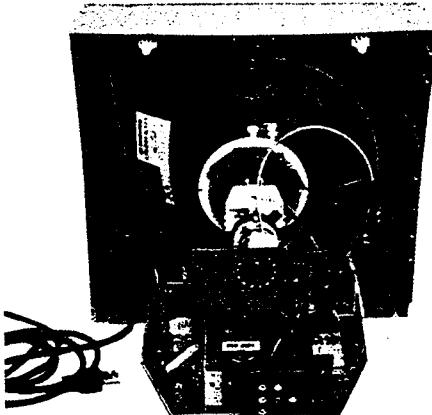
1. Remove the five screws securing the rear cover of the cabinet. (See **Fig. 3**)
2. Pull the rear cabinet about 10cm to the rear.
3. Remove the rear cabinet.
4. Remove solder connection of the black wire connecting CRT grounding and neck p.c board, then remove the neck p.c board from the picture tube. (See **Fig. 5**)
5. Remove the second anode cap.
6. Remove the connectors as follows:
  - 1) Deflection yoke connector
  - 2) Degaussing coil connector
  - 3) Speaker connector
7. Remove the two screws securing the power switch.
8. Take the chassis out of the cabinet.
9. To install the chassis, repeat the above procedure in reverse order.



Remove five Screws

Fig. 3

Remove Second Anode Cap



Remove Solder Connection of  
Black Wire from CRT Ground

Fig. 5

## MAIN CHASSIS SERVICING

1. Remove the rear cabinet.
2. Repairing of main chassis can be done easily, if stood as shown in **Fig. 6**.

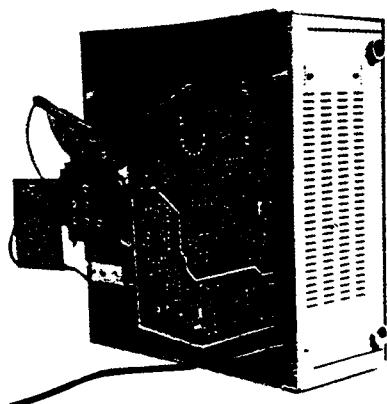


Fig. 6

## PICTURE TUBE REMOVAL

In order to remove or replace the picture tube, the chassis must first be removed. Refer to Chassis Removal procedure. After the chassis has been removed, proceed as follows.

1. Loosen the clamping screws on the deflection yoke, purity and static convergence magnet, and remove them.
2. Remove four screws securing the picture tube to the front cabinet.

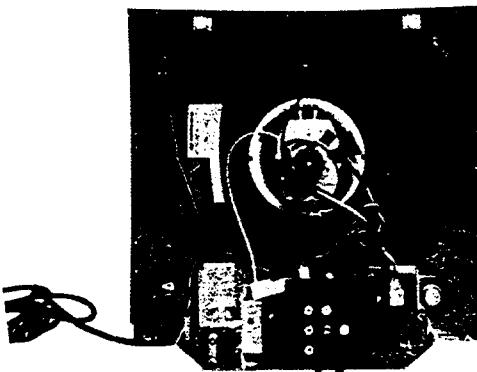


Fig. 7

## PRECAUTIONS FOR REPAIRS

1. Check for bad contacts on connectors on the main PC board and elsewhere by applying hand pressure.
2. Check AC power supply for problems-e.g. blown fuse, bad switch or AC outlet.
3. Check for intermittents or defective soldering on the main board by striking the reverse side of the board gently with an insulated bar.
4. When soldering PC boards, limit the soldering iron temperature to 500°F (200°C) to avoid peeling of the foil.
5. When soldering transistors or other semiconductors, use tweezers or a heat sink clip as shown in **Fig. 8** to prevent heat damage.

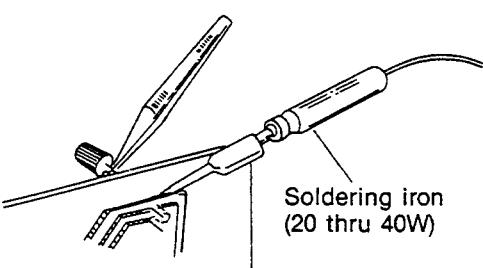


Fig. 8

## TROUBLESHOOTING

As major parts of this chassis employ ICs, defects can often be isolated by referring to the table of symptoms in **Table 1**. Additional checks of transistor and IC DC voltages and waveforms as shown on the schematic will assist in pinpointing the problem area. Remember also to check for faulty resistors and capacitors, etc. around defective ICs and transistors.

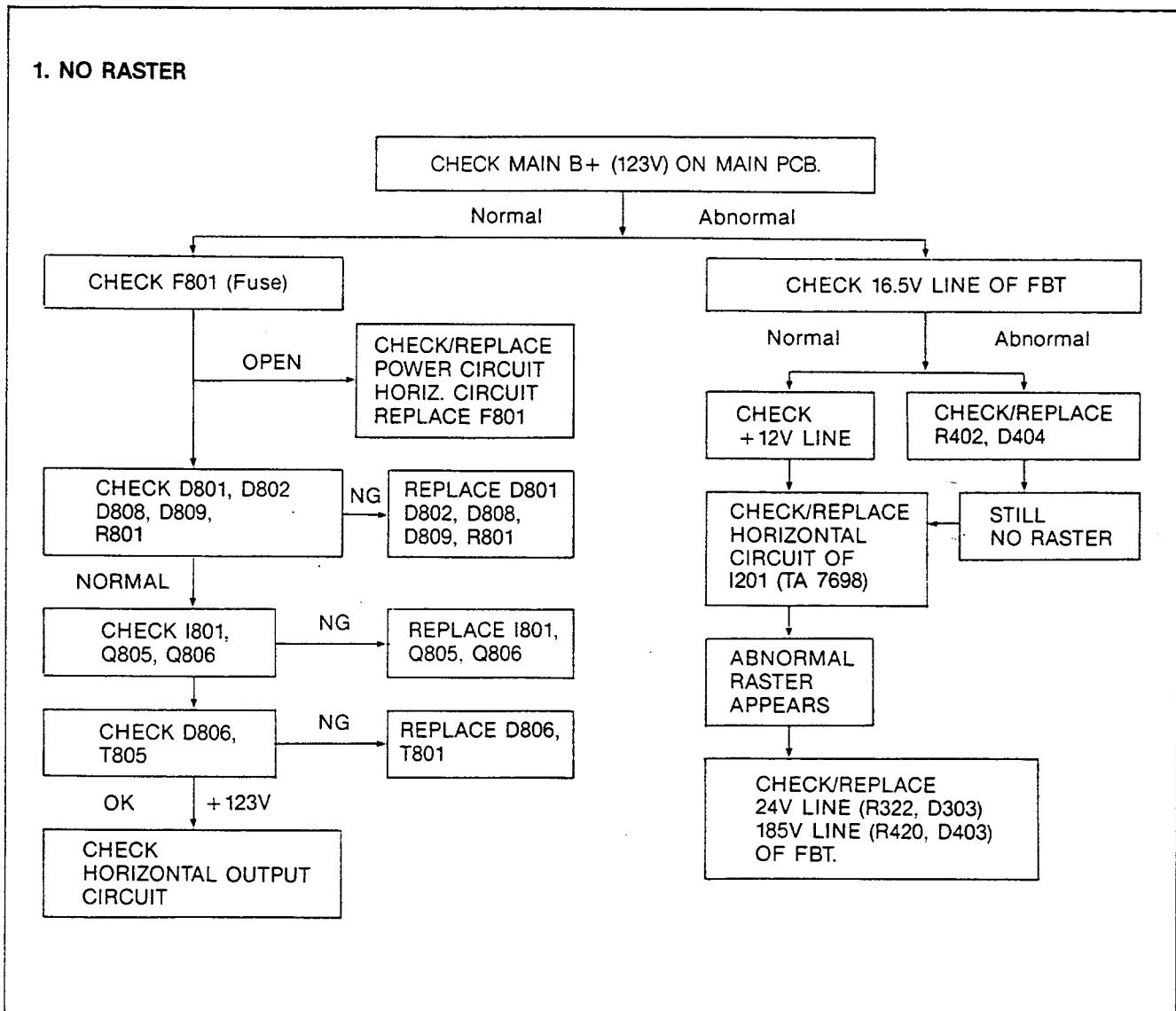
**Table 1 IC/TR Failure and Symptoms**

IC/TR	SYMPTOM
I201: Video Chroma Circuit  Vert./Horiz. osc., Drive/Sync. sep. circuit	Composite/Separate/Monochrome-mode reception No picture and poor picture. No color and monochrome. Poor color synchronization. Hue discrepancy. Vertical line only. No picture, No high voltage. Unstable picture.
I301: Vert. output circuit	Horizontal line only. Poor vertical scan.
I801: S.M.PS. circuit	No power (No Lamp)
I701: Video interface circuit switch.	No picture or poor picture. Incorrect color.
I601: Audio amp. circuit	No sound or poor sound
Q001, Q003, Video amp. circuit Q005, Q007	Composite/Separate mode/Mono No picture or poor picture.
Q701: 4.43MHz trap. circuit	Composite mode Small dotted stripes appear in the picture.
Q203: Video drive output circuit	Composite/Separate mode/Mono No video or poor video
Q702: Chroma amp. circuit	Separate mode No color or incorrect color.
Q401: Horiz. drive circuit	No picture Does not generate high voltage.
Q402: Horiz. output circuit	No picture, does not generate high voltage, fuse is blown.
Q202: ABL circuit	Dark or brighter picture.
Q552: Green output circuit	No green picture. Green with retrace line picture.
Q551: Red output circuit	No red picture. Red with retrace line picture.
Q553: Blue output circuit	No blue picture. Blue with retrace line picture.

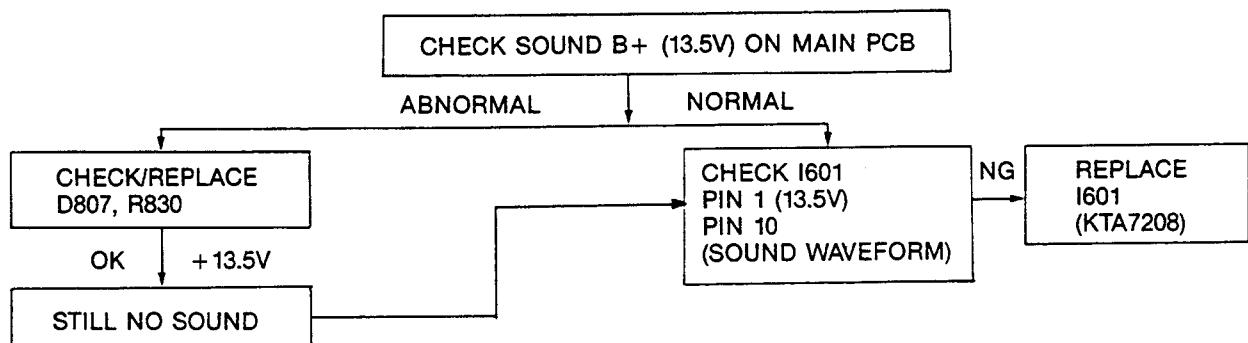
## TROUBLESHOOTING CHARTS

The following charts are devoted to troubleshooting which, if followed carefully, will assist you in tracking down a fault to the collect stage. In order to utilize the charts (fault trees), firstly establish the complaint, i.e. no raster.

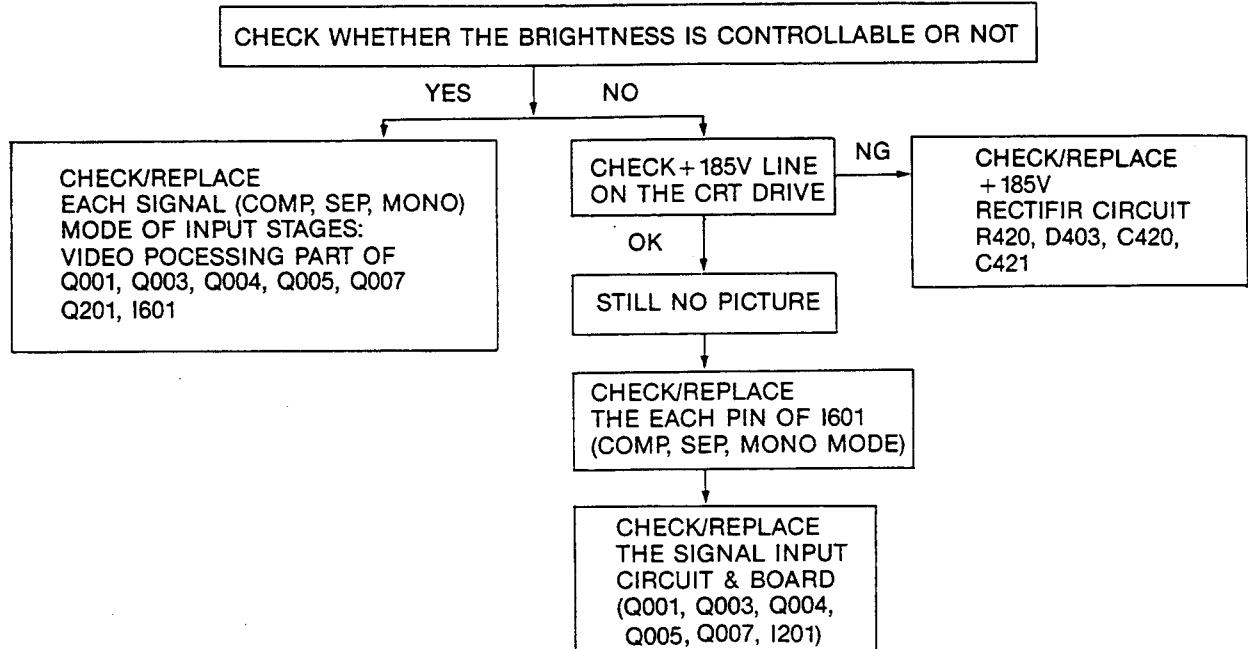
Locate the chart applicable and then progress through the various alternatives until a final block the offending components or stage.



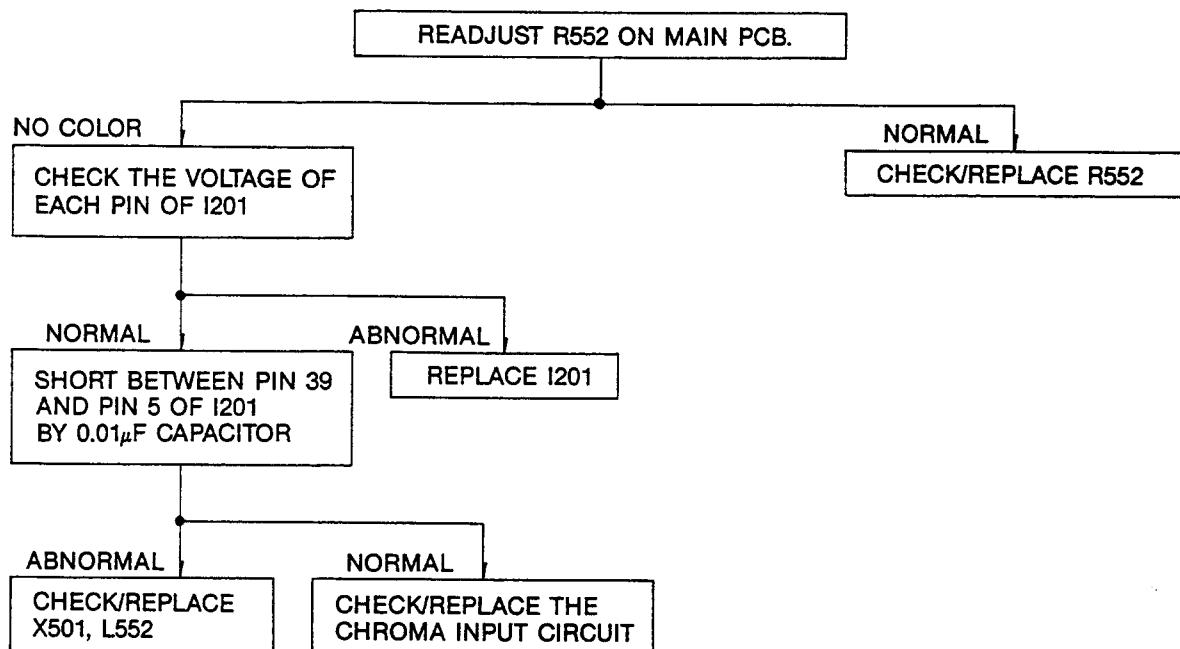
## 2. NO SOUND



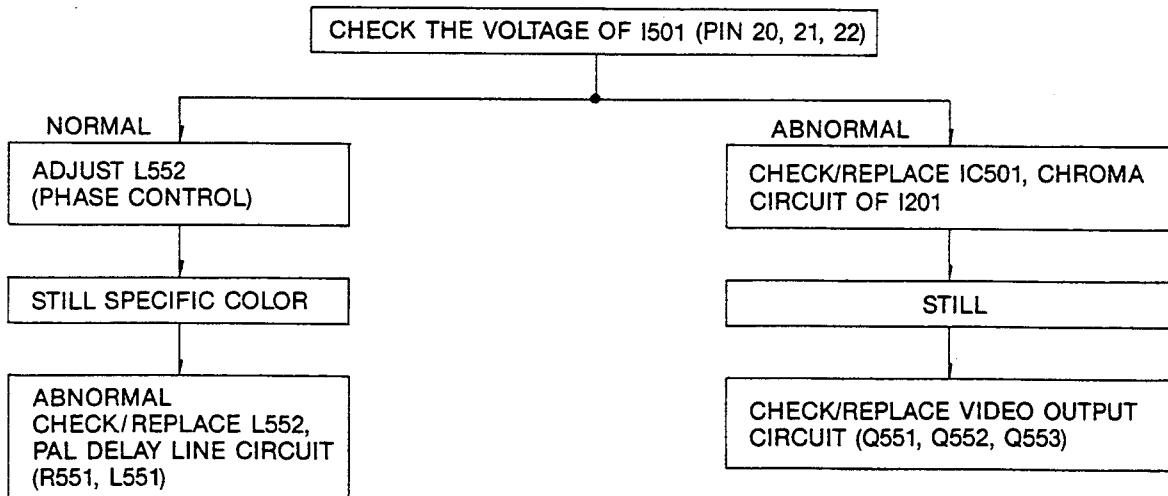
## 3. NO PICTURE



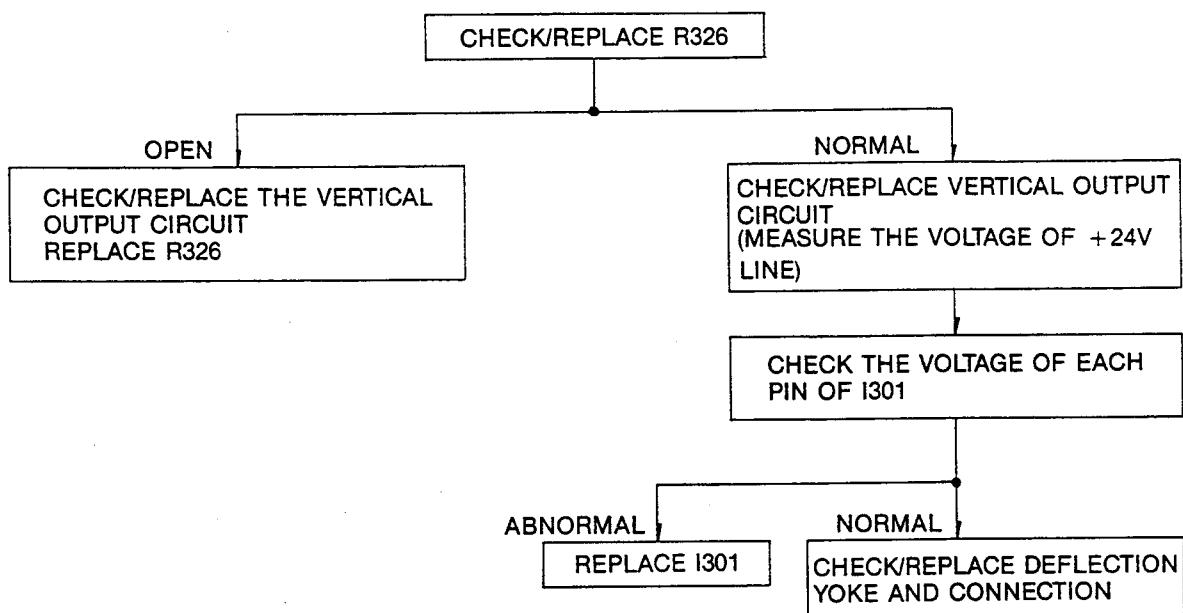
#### 4. NO COLOR (FOR COMP. & SEP MODE)



#### 5. SPECIFIC TINTED COLOR



## 6. NO VERTICAL SCAN (ONE HORIZ. LINE RASTER)



## 7. OUT OF VERTICAL SYNC. AND HORIZ. SYNC.

CHECK/REPLACE SYNC. SEPARATION CIRCUIT AND I201

## 8. OUT OF VERTICAL SYNC. 9. OUT OF HORIZ. SYNC.

CHECK/REPLACE VERTICAL OSC. PART OF I201

## 9. OUT OF HORIZ. SYNC.

CHECK/REPLACE HORIZ OSC. PART OF I201, AFC CIPCUIT

## DESOLDERING OF ICS AND TR

The following tools are suggested for desoldering semiconductors:

### 1. Desoldering tools

- a) Hand suction type-Solda-Pull® (model SS011, Edsyn Inc. Van Nuys, CA.) or equivalent.
- b) Wire-Wick type-Solder-Wicle® (size=4, Solder Removal Co., Covina, CA) or equivalent.

2. Soldering Iron-Maximum wattage recommended is 40W. Higher power soldering irons may damage the copper foil of board.

### Note:

When desoldering parts, heat the joint and remove the solder quickly. The PC foil may peel from the board if heat is applied for too long.

Desoldering  
Fibbon

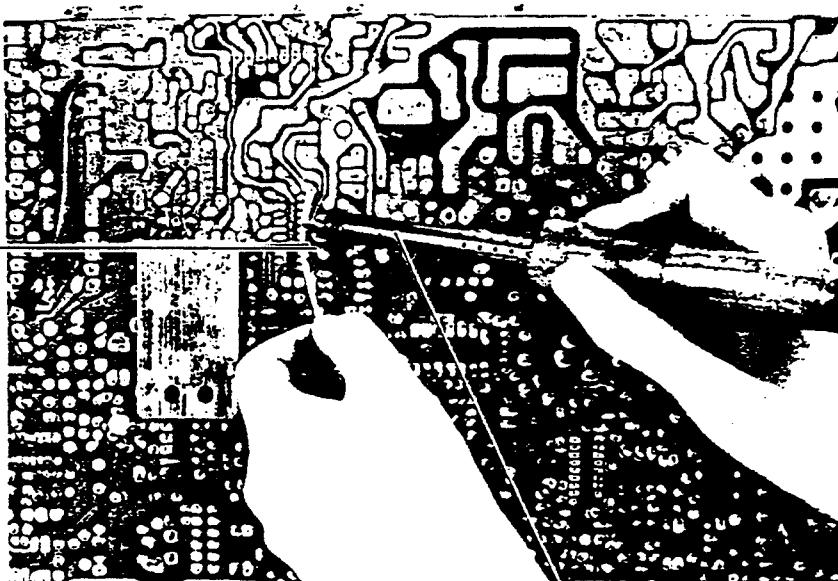


Fig. 9

## SERVICE ADJUSTMENT

### FOCUS ADJUSTMENT

Adjust the focus control, located on the H.V. unit (T461) for maximum overall definition and fine picture detail with brightness and contrast controls set at normal viewing levels.

### VERTICAL SIZE (R901) ADJUSTMENT

The vertical size (height) control is the screwdriver adjustment that is accessible through the front cover.

Location of the control is shown in **Figs. 1 and 10**. These controls must be adjusted until the correct picture or test pattern is obtained.

### CIRCUIT PROTECTION

4.0A fuse, mounted on the main PC board, has been provided to protect the power out put circuit. See **Figs. 2 and 10**.

### HORIZONTAL HOLD (R409) ADJUSTMENT (SEE FIGS. 1 AND 10)

Receive the color signal.  
Set the brightness and contrast controls to a normal position. A warm-up period of at least five minutes should be allowed and alignment should be done.

1. Connect a capacitor (2 $\mu$ F/50V) between pin 37 of I201 and Ground.
2. Adjust the horiz. hold control (R409) until the picture is stable. (Tune R409 to 15.625KHz). After adjustment, remove the capacitor.

## APC ADJUSTMENT (SEE FIG. 10)

This adjustment should be made only when the chroma/video IC (I201) or parts of the APC circuit have been replaced, or when the picture colors are unstable. For adjustment, use the APC ADJ. control (T501).

### Procedures

1. Apply a colour bar signal to the video input terminal. Turn the colour control fully clockwise and position the Brightness, controls at mechanical center.
2. Cut off the colour killer by connection of Pin 2 and Pin 12 of IC501 with 10k ohm resistor. (Set the contrast, brightness, colour controls to maximum)
3. Short L552 to ground with a jumper Wire.
4. Adjust R552 so that the colour bar pattern stands still or drifts slowly across the picture screen.
5. After adjustment, remove the jumper wire and resistor.
6. Check that the colour sync is stable with channel changing and power on-off operation. If the colour is slow to appear or the colour sync is out of order, retouch the colour sync R552 for proper colour display.

## COLOR AMPLITUDE AND PHASE ADJUSTMENT

1. Receive PAL/DEM-bar signal.
2. Connect the probe of oscilloscope to B-Y output.
3. Adjust L552 and R551 in order to make wave form flat on screen.
4. Receiver color bar signal instead of DEM signal.
5. Adjust L551 to make B-Y output stable.

## VERTICAL POSITION CONTROL (R359) ADJUSTMENT (SEE FIG. 10)

The vertical position control (R359) is the VR which controls the vertical position of the picture. If the vertical position of the picture is not at the center of the picture tube, adjust the vertical position by turning this control.

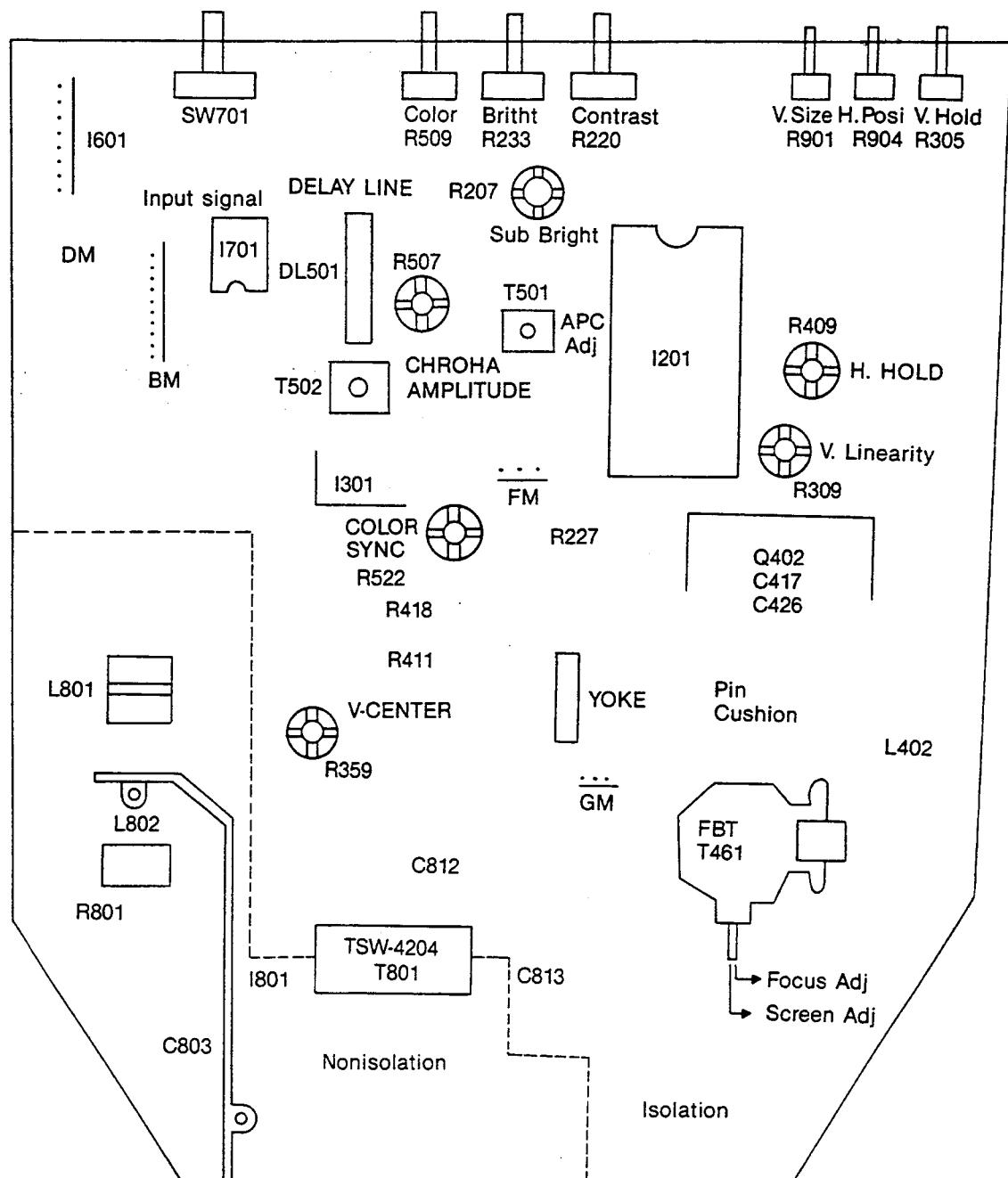


Fig. 10

## VERTICAL LINEARITY CONTROL (R309) ADJUSTING (SEE FIG. 10)

The vertical linearity control (R309) is the VR which controls the vertical linearity of the picture. After received cross hatch pattern, adjust the vertical linearity by turning this control.

## **SUB BRIGHTNESS (R223)**

This control is adjusted at the factory.  
When readjustment is required, proceed as follows:  
1. Receive H characters pattern at SEP mode.  
2. Set the contrast and brightness controls at the mechanical minimum position.  
3. Adjust the sub brightness control so that back ground of the picture is just disappeared..

## **COLOR PURITY ADJUSTMENT**

For best results, it is recommended that the purity adjustment be made in the final location. If the monitor will be moved, perform this adjustment with it facing east or west. The monitor must have been operating 15 minutes prior to this procedure and the faceplate of the CRT must be at room temperature.

The monitor is equipped with an automatic degaussing circuit. However, if the CRT shadow mask has become excessively magnetized, it may be necessary to degauss it with a manual coil. Do not switch the coil OFF while the raster shows any effect from the coil. Purity magnets are used for color purity and vert. centering adjustment.

Purity adjustment procedure is as follows.

### **NOTE:**

Before attempting any purity adjustments, the receiver should be operated for at least 15 minutes.

1. Demagnetize the picture tube and cabinet using a degaussing coil.
2. Turn the CONTRAST and BRIGHTNESS controls to maximum.
3. Adjust RED and BLUE Bias controls (R554 and R564) to provide only a green raster. Advance the GREEN BIAS control (R559) if necessary.
4. Loosen the clamp screw holding the yoke, and slide the yoke backward to provide vertical green belt (zone) in the picture screen.
5. Remove the Rubber Wedges.
6. Rotate and spread the tabs of the purity magnet (See Fig. 7) around the neck of the picture tube until the green belt is in the center of the screen. At the same time, center the raster vertically.
7. Move the yoke slowly forward until a uniform green screen is obtained.  
Tighten the clamp screw of the yoke temporarily.
8. Check the purity of the red and blue raster by adjusting the BIAS controls.
9. Obtain a white raster, referring to "Black and white tracking".
10. Proceed with convergence adjustment.

## STATIC CONVERGENCE ADJUSTMENT

A recently developed deflection yoke and electron guns construction has been used on this equipment in combination with in-line guns and black stripe screen to make a barrel-type magnetic-field distribution for vertical deflection and pin-cushion-type magnetic field for horizontal deflection with which a self-converging system can be obtained. This type is different from conventional unity magnetic field distribution type deflection yoke. 4-pole magnets and 6-pole magnets are employed for static convergence instead of a convergence yoke.

1. A crosshatch signal should be connected to the video input terminal of the monitor.
2. Adjust the BRIGHTNESS and CONTRAST Controls for well defined pattern.
3. Adjust two tabs of the 4-pole Magnets to change the angle between them (See Fig. 11) and superimpose red and blue vertical lines in the center area of the picture screen. (See Fig. 12)
4. Turn both tabs at the same time keeping their angles constant to superimpose red and blue horizontal lines at the center of the screen. (See Fig. 12)
5. Adjust two tabs of 60-pole Magnets to superimpose red/blue line with green one. Adjusting the angle affects the vertical lines and rotating both magnets affects the horizontal lines.
6. Repeat adjustments 3, 4, 5, keeping in mind red, green and blue movement, because 4-pole Magnets and 6-pole Magnets interact and make dot movement complex.

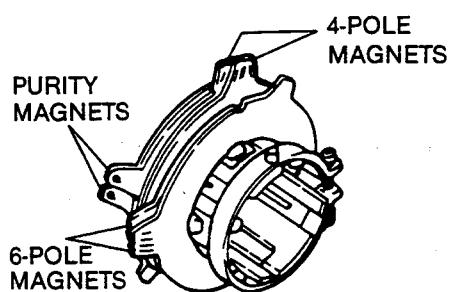
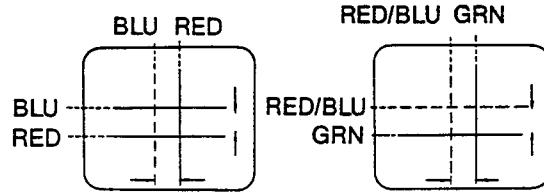


Fig. 11



4-Pole Magnets Movement 6-Pole Magnets Movement

CENTER CONVERGENCE BY  
CONVERGENCE MAGNETS

Fig. 12

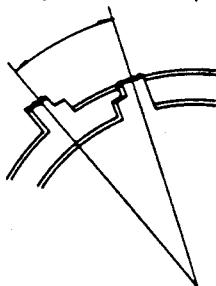
## PRECISE ADJUSTMENT OF DYNAMIC CONVERGENCE (SEE FIGS. 13 AND 14)

### NOTE:

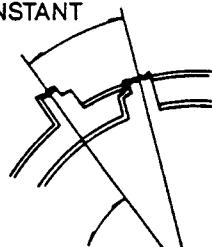
This adjustment requires Rubber Wedge Kit.

1. Loosen the clamping screw of deflection yoke to allow the yoke to tilt.
2. Place a wedge as shown in **Fig. 15** temporarily. (Do not remove cover paper on adhesive part of the wedge.)
3. Tilt front of the deflection yoke up or down to obtain better convergence in circumference. (See **Fig. 14**) Push the mounted wedge into the space between picture tube and the yoke to hold the yoke temporarily.
4. Place other wedge into bottom space and remove the cover paper to stick.
5. Tilt front of the yoke right or left to obtain better convergence in circumference. (See **Fig. 14**.)
6. Hold the yoke position and put another wedge in either upper space.  
Remove cover paper and stick the wedge on picture tube to hold the yoke.
7. Detach the temporarily mounted wedge and put it in another upper space.  
Stick it on picture tube to fix the yoke.
8. After placing three wedges, recheck overall convergence.  
Tighten the screw firmly to hold the yoke tightly in place.
9. Stick 3 adhesive tapes on wedges as shown in **Fig. 15**.

### ADJUST THE ANGLE (Vertical lines)



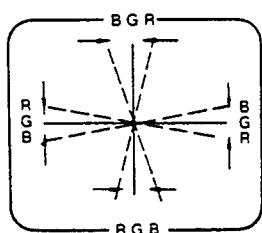
### CONSTANT



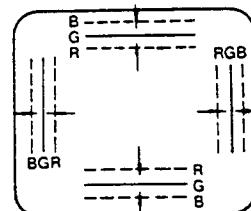
### ROTATE TWO TABS AT THE SAME TIME (horizontal lines)

### ADJUSTMENT OF MAGNETS

Fig. 13



INCLINE THE YOKE UP (OR DOWN)



INCLINE THE YOKE RIGHT (OR LEFT)

Fig. 14

## BLACK AND WHITE TRACKING

The purpose of this procedure is to optimize the picture tube to obtain a good black and white picture at all brightness levels, while at the same time achieving maximum usable brightness. Normal purity adjustment must precede this procedure.

1. Set the Video mode switch to SEP Mode position.
2. Connect the black signal to SEP input terminal.
3. Set the brightness and contrast control at the mechanical center position.
4. Rotate the red, green and blue cut off controls fully counter-clockwise.
5. Rotate the G. drive and R. drive controls to midrange.
6. Rotate screen VR fully counter-clockwise.
7. Short circuit G and H with a jumper clip to produce a horizontal line.
8. Slowly turn the screen control on FBT clockwise until color (colors) appears faintly on the screen.
9. Adjust each cut-off control so that color becomes lightest and horizontal lines are turned to white color.
10. Remove the jumper clip.
11. Receive the white signal.
12. Adjust R/G drive controls (R555, 565) to produce a hi-lite white screen.
13. Set the brightness and picture controls to minimum.

Then, the raster should appear dark.

14. Move the brightness control until a dim raster is obtained.
15. If necessary, touch-up adjustment of the three cut off controls to obtain best white uniformity on the CRT screen.
16. Set the brightness and picture controls at the mechanical center position. If necessary, adjust the R. drive and G. drive controls to produce a uniform black and white picture.

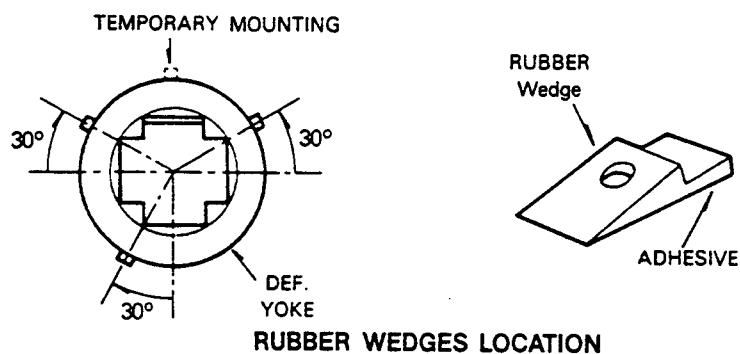
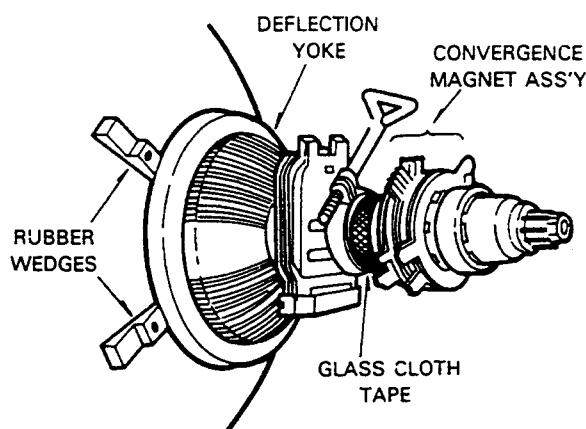


Fig. 15



Picture Tube Neck Components Location

Fig. 16

# SERVICE INFORMATION

## REAR CONNECTION PANEL

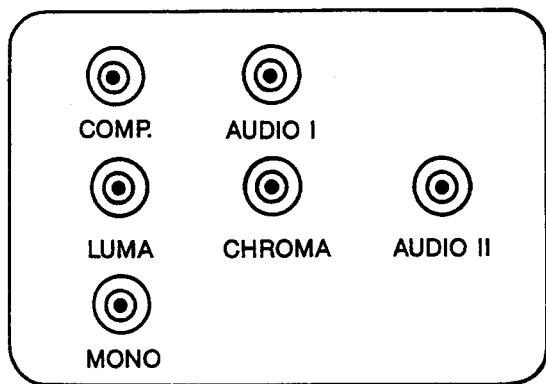


Fig. 17 Signal Input Panel

## P.C. BOARD LAYOUT

LED PC BOARD



BOTTOM VIEW

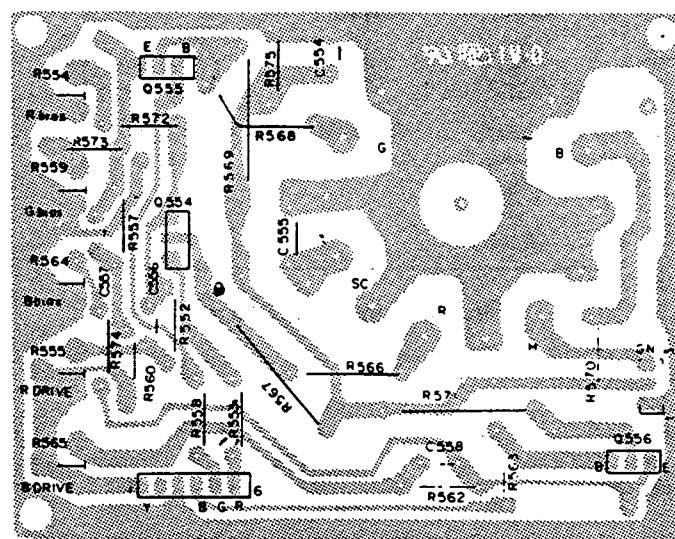


TOP VIEW

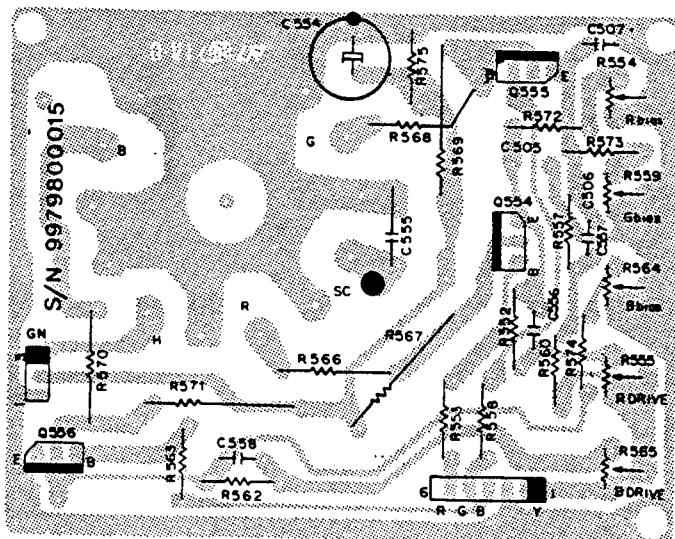
Fig. 18

## NECK P.C. BOARD

## NECK P.C. BOARD



**Fig. 19-a Bottom View**



**Fig. 19-b Top View**

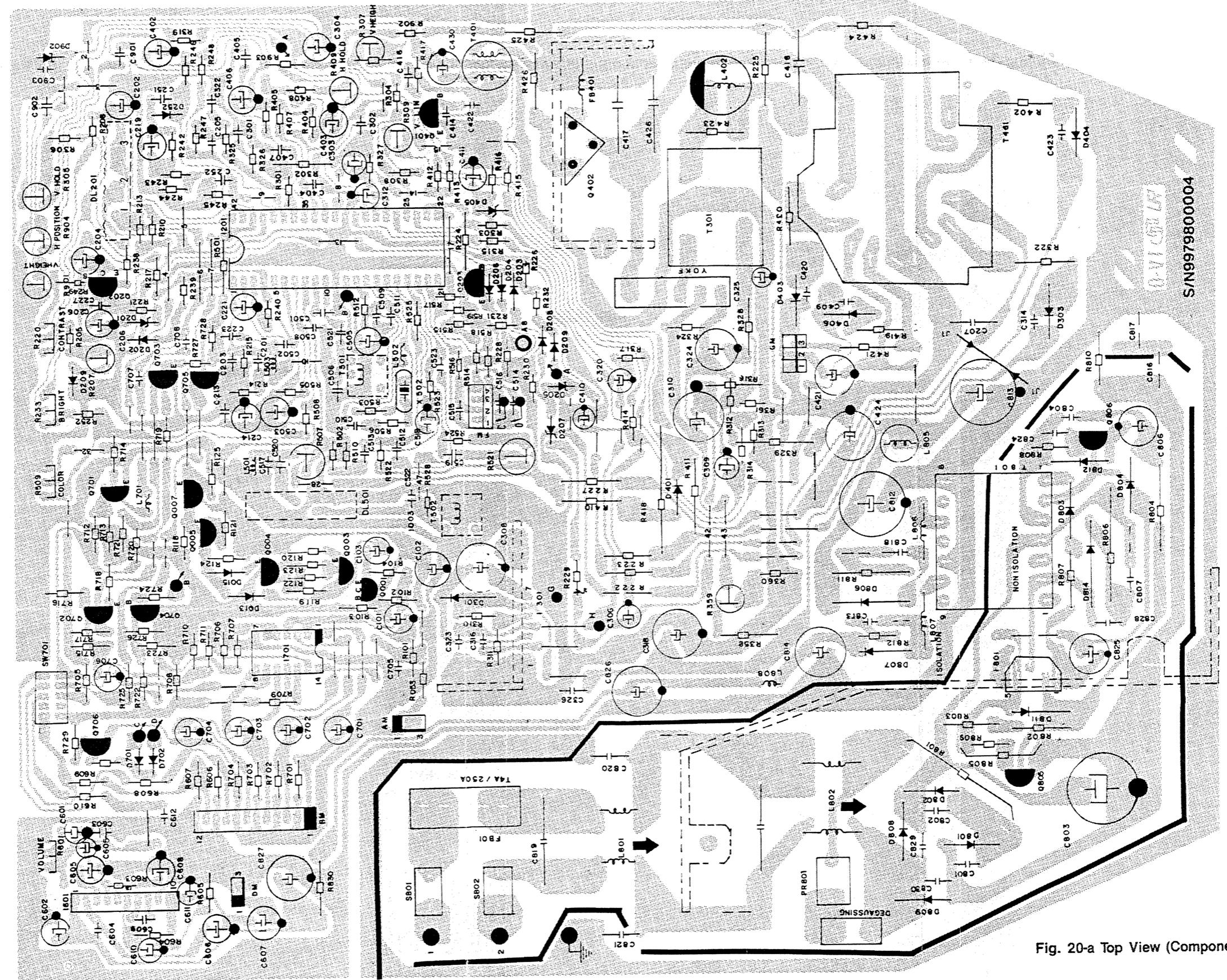


Fig. 20-a Top View (Component Side)

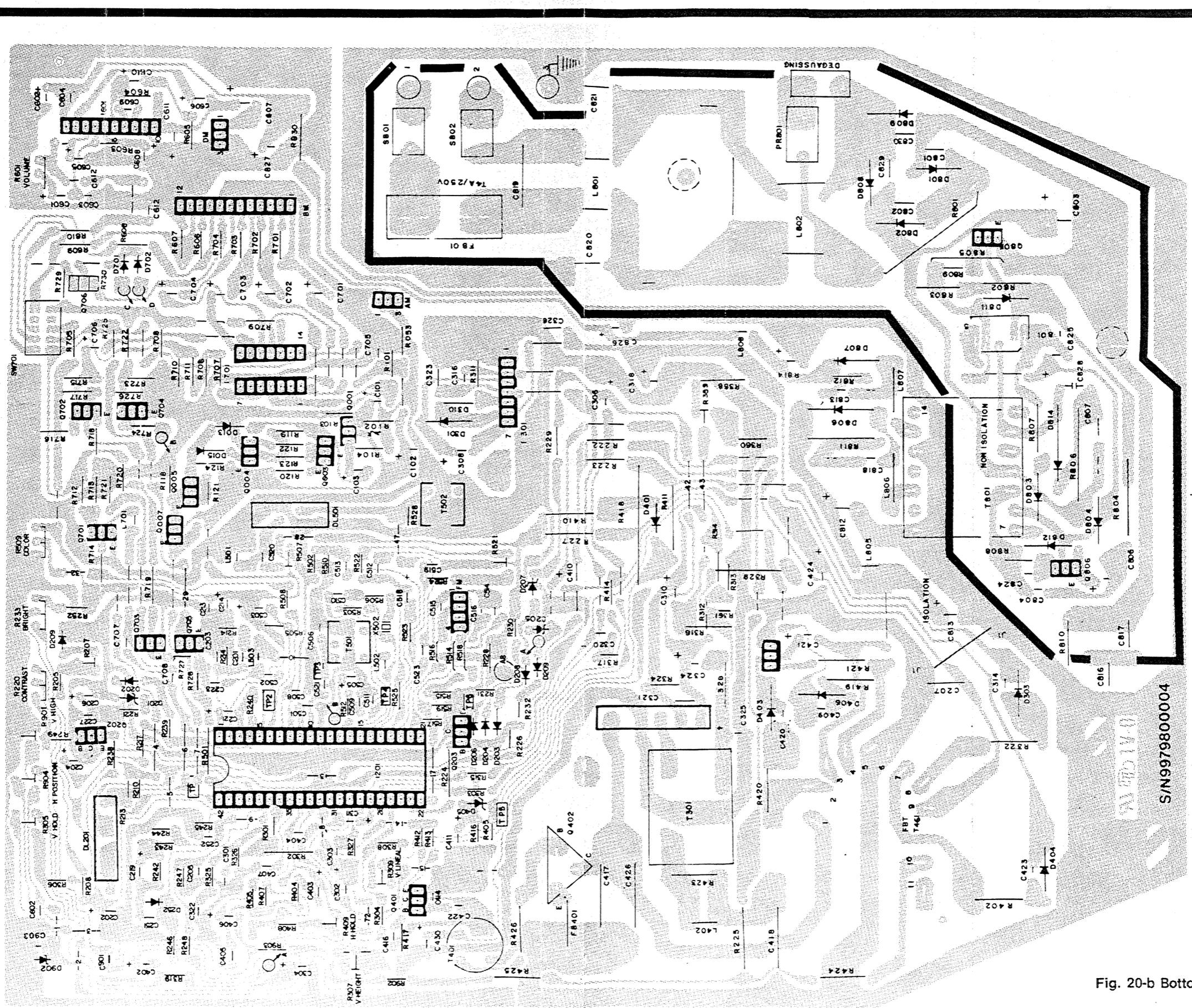
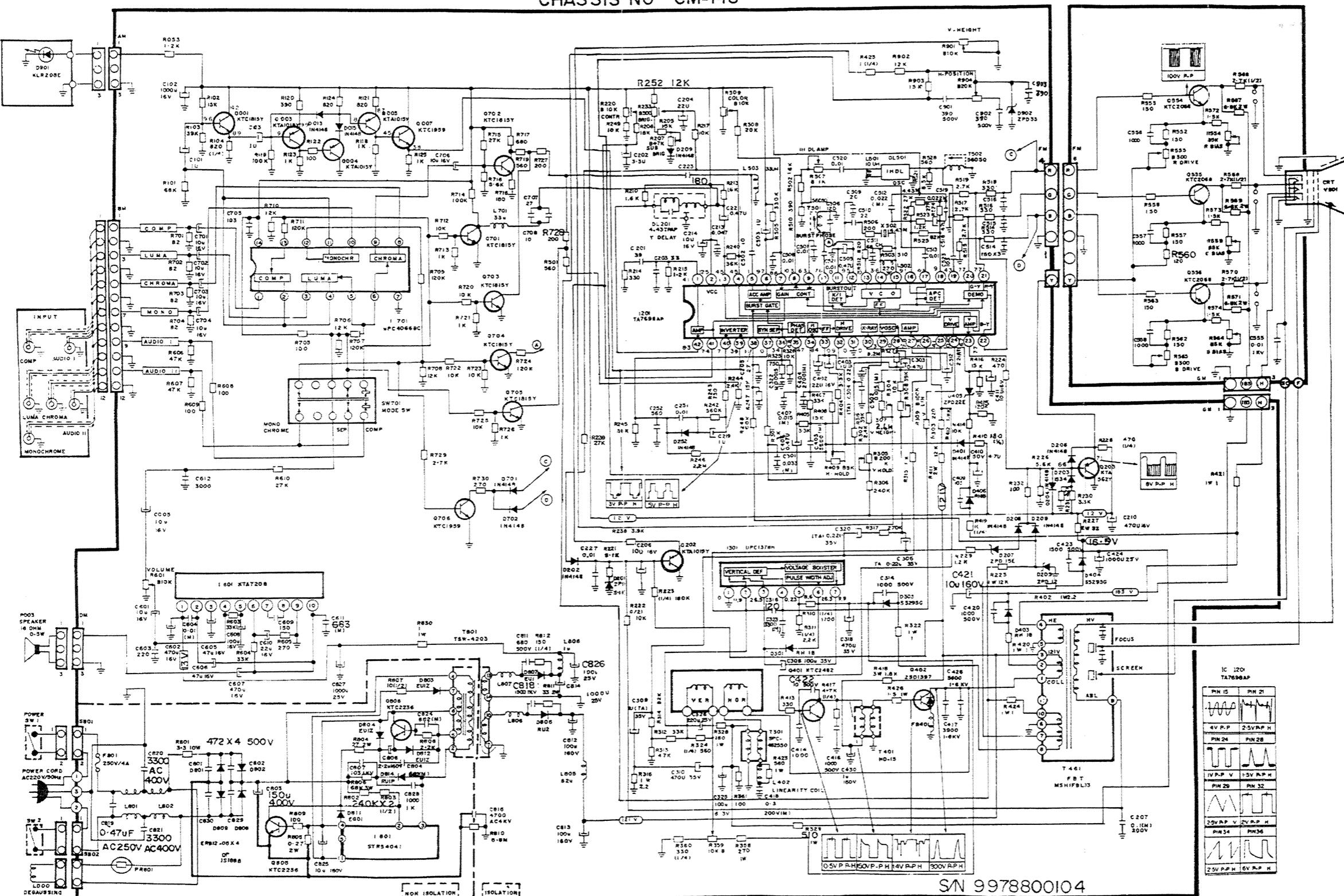


Fig. 20-b Bottom View (Solder side)

SCHEMATIC DIAGRAM  
CHASSIS NO CM-146

CIRCUIT DIAGRAM



NOTE  
 1. RESISTANCE IS SHOWN IN OHM, K(1,000), M(1,000,000).  
 2. UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITOR VALUES LESS THAN 1 ARE EXPRESSED IN  $\mu$ F AND THE VALUES MORE THAN 1 ARE EXPRESSED IN MF.  
 3. UNLESS OTHERWISE NOTED IN SCHEMATIC ALL INDUCTOR VALUES MORE THAN 1 ARE EXPRESSED IN MH AND THE VALUES LESS THAN 1 ARE EXPRESSED IN H.

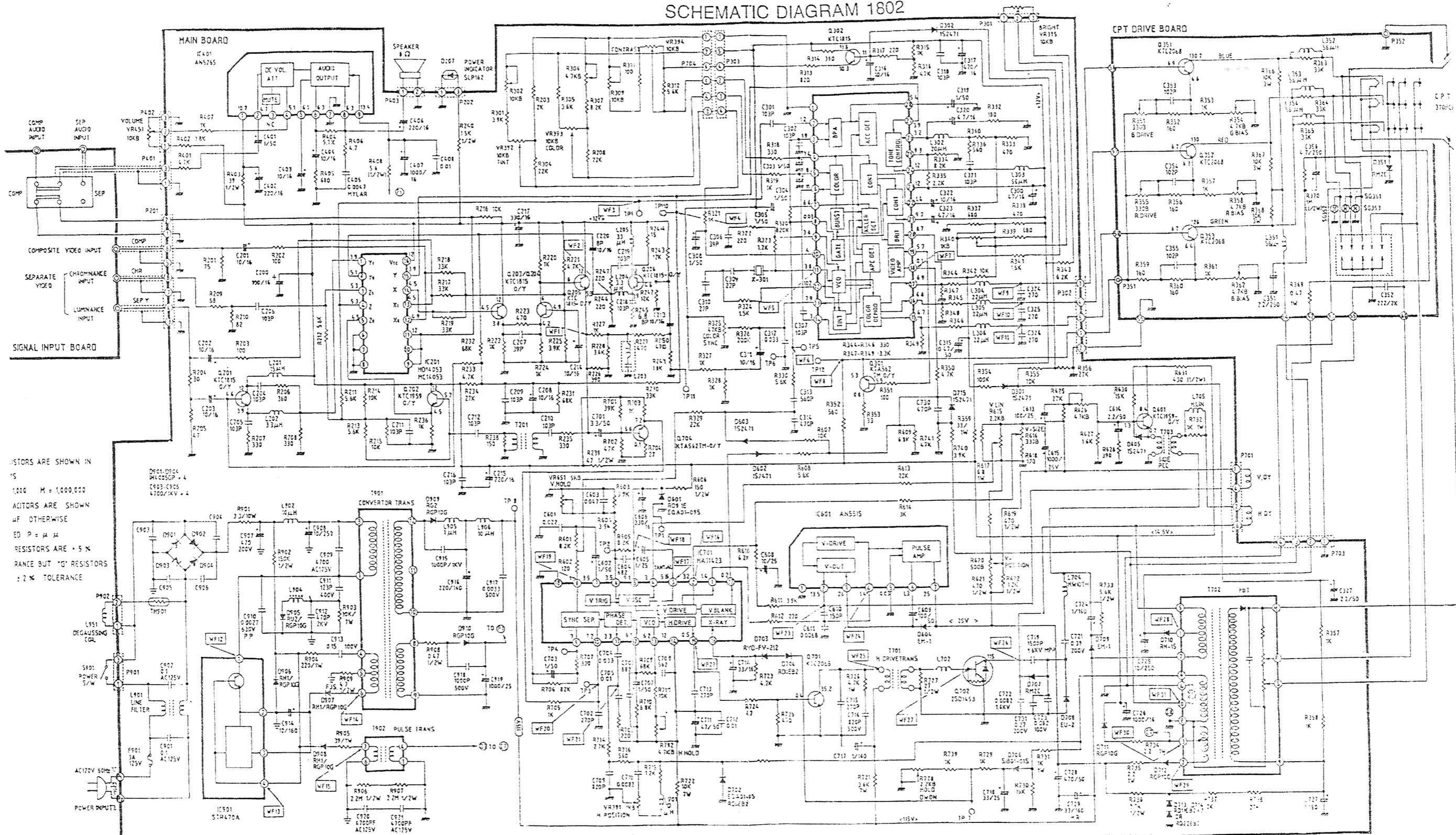
4. VOLTAGES READ WITH "VTVM" FROM POINT INDICATED TO CHASSIS GROUND, USING A COLOR BAR SIGNAL WITH ALL CONTROLS AT NORMAL LINE VOLTAGE (120 VOLTS AC). VOLTAGE READINGS SHOWN ARE NOMINAL VALUES AND MAY VARY  $\pm 20\%$  EXCEPT H.V.  
 5. THIS CIRCUIT DIAGRAM IS A STANDARD ONE. CIRCUITS PRINTED MAY BE SUBJECT TO CHANGE FOR PRODUCT IMPROVEMENT WITHOUT PRIOR NOTICE.

CAUTION TO THE SERVICE TECHNICIAN:  
 BEFORE RETURNING THE RECEIVER TO THE CUSTOMER,  
 TO MAKE APPROPRIATE LEAKAGE CURRENT OR RESISTANCE MEASUREMENTS TO DETERMINE THAT EXPOSED PARTS ARE PROPERLY INSULATED FROM THE SUPPLY CIRCUIT.

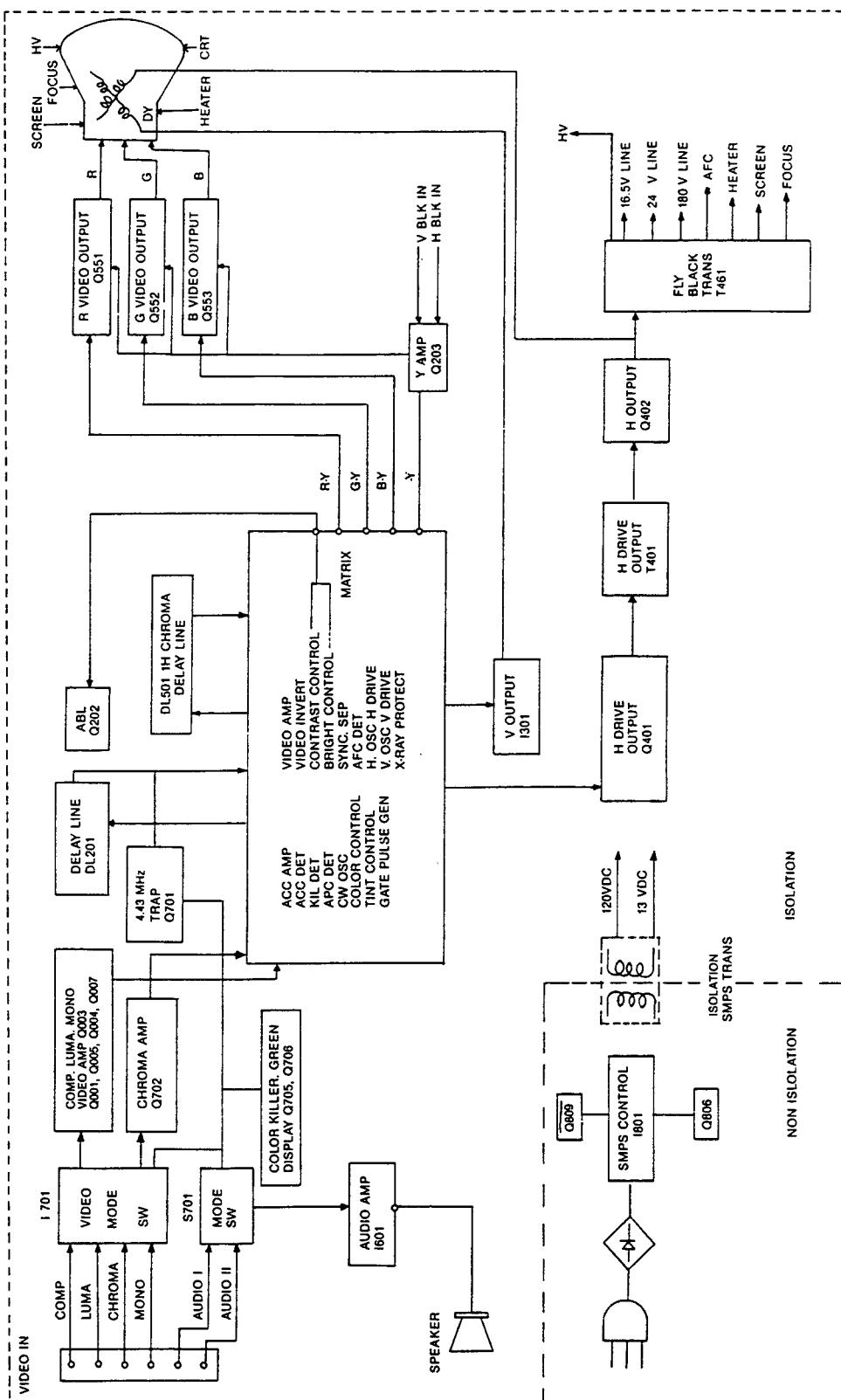
"WARNING"  
 BEFORE SERVICING THIS CHASSIS, READ THE "X-RAY RADIATION PRECAUTION", "SAFETY PRECAUTION" AND "PRODUCT SAFETY NOTICE" IN THE SERVICE MANUAL.  
 DO NOT DEGRADE THE SAFETY OF THE RECEIVER THROUGH IMPROPER SERVICING.

CAUTION: THE SHADeD AREAS IN THE SCHEMATIC DIAGRAM DESIGNATE COMPONENTS WHICH HAVE SPECIAL CHARACTERISTICS IMPORTANT FOR SAFETY AND SHOULD BE REPLACED ONLY WITH TYPES IDENTICAL TO THOSE IN THE ORIGINAL CIRCUIT OR SPECIFIED IN THE PARTS LIST.  
 DO NOT DEGRADE THE SAFETY OF THE RECEIVER THROUGH IMPROPER SERVICING.

## SCHEMATIC DIAGRAM 1802



## BLOCK DIAGRAM OF CM-146



## PARTS LIST

\* Mark: X-RAY RADIATION RELATED PARTS

▲ Mark: SAFETY RELATED PARTS

● Mark: CRITICAL PARTS

Ref. No.	Commodore Part No.	Description	Vendor Part No.
1	602150-00A	1802 Monitor (PAL, VDE)	
2	602150-00B	1802 Monitor (PAL, BEAB)	
3	602150-00C	1802 Monitor (PAL, BEAB, Aust)	
Location	Commodore Part No.	Description	Vendor Part No.
00010	602150-01	PCB MAIN ASSY CM-146	997A100001
	602150-02	Wire Tin Coated	2301160270
	602150-03	Conn Wafer	4859205320
A	602150-04	PCB Main	9979800004
AB	602150-05	Wax Cover	2291140501
AC	602150-06	Solder Wire	2193011601
AD	602150-07	Wax Micro	2291140601
AE	602150-08	Grease Silicon	2291130202
AF	602150-09	Paint Locking	223303007
AG	602150-10	Flux Solvent	2291050803
AH	602150-11	Flux Tablet	2291050702
AM	602150-12	Conn Wafer	4859201120
AN	602150-13	Conn Assy	9970700032
A1	602150-14	Tube Vinyl	8-UV0005BK
A2	602150-15	Cord Power, P-2681/ES-302-75	9979900005
	602150-16	Cord Power, BS6500/GS-302-75	9979900006
BM	602150-17	Conn Wafer	4859202320
BN	602150-18	Conn Assy	9970700035
CL	602150-19	Caution High Voltage Sticker	9975810800
C005	602150-24	Cap, Electro, 10MF, 16V RS	CEXE1C100A
C101	602150-25	Cap, Electro, 1MF, 50V RS	CEXE1H109A
C102	602150-26	Cap, Electro, 1000MF, 16V RS	CEBE1C102A
C103	602150-25	Cap, Electro, 1MF, 50V RS	CEXE1H109A
C201	602150-28	Cap, Cera, 39PF, 50V J	CXCH1H390J
C202	602150-29	Cap, Electro, 3.3MF, 16V RS	CEXE1C339A
C203	602150-30	Cap, Cera, 33PF, 50V J	CXCH1H330J
C204	602150-31	Cap, Electro, 22MF, 16V RS	CEXE1C220A
C205	602150-32	Cap, Cela, 27PF, 50V J	CXQH1H270J
C206	602150-33	Cap, Electro, 10MF, 16V RU	CEXF1C100C
C207	602150-34	Cap, Mayler, 0.1MF, 200V J	CMXA2D104J
C210	602150-35	Cap, Electro, 470MF, 16V RS	CEXE1C471A
C213	602150-36	Cap, Cera, 0.047MF, 50V Z	CCXF1H473Z
C214	602150-37	Cap, Electro, 10MF, 16V RS	CEXE1C100A
C219	602150-22	Cap, Electro, 1MF, 50V RS	CEXE1H109A
C221	602150-39	Cap, Electro, 0.47MF, 50V RS	CEXE1H478A
C223	602150-40	Cap, Cera, 180PF, 50V K	CCXB1H181A
C227	602150-41	Cap, Cera, 0.01MF, 50V Z	CCXF1H103Z

Location	Commodore Part No.	Description	Vendor Part No.
C251	602150-41	Cap, Cera, 0.01MF, 50V Z	CCXF1H103Z
C252	602150-43	Cap, Cera, 560PF, 50V K	CCXB1H561K
C301	602150-44	Cap, Mylar, 0.033MF, 100V K	CMXA2A333K
C302	602150-45	Cap, Mylar, 0.015MF, 100V K	CMXA2A153K
C303	602150-39	Cap, Electro, 0.47MF, 50V RS	CEXE1H478A
C304	602150-47	Cap, Tantal, 0.22MF, 35V K	CTXD1V228K
C306	602150-47	Cap, Tantal, 0.22MF, 35V K	CTXD1V228K
C308	602150-49	Cap, Electro, 100MF, 35V RS	CEXE1V101A
C309	602150-50	Cap, Tantal, 1MF, 35V K	CTXD1V109K
C310	602150-51	Cap, Electro, 470MF, 35V RS	CEXE1V471A
C312	602150-52	Cap, Electro, 2.2MF, 50V	CEXD1H229B
• C314	602150-53	Cap, Cera, 1000PF, 500V K	CCXB2H102K
C316	602150-54	Cap, Cera, 120PF, 50V J	CXCH1H121J
C318	602150-56	Cap, Electro, 470MF, 35V RS	CEXE1V471A
C320	602150-35	Cap, Tantal, 0.22MF, 35V SM	CTXD1V228A
C322	602150-57	Cap, Mylar, 1500PF, 100V K	CMXA2A152K
C323	602150-58	Cap, Cera, 1500PF, 50V K	CCXB1H152K
C325	602150-59	Cap, Electro, 100MF, 6.3V RS	CEXE0J101A
C402	602150-60	Cap, Electro, 22MF, 16V RS	CEXE1C220A
C403	602150-61	Cap, Electro, 1MF, 50V RS	CEXE1H109A
C404	602150-62	Cap, Mylar, 2700PF, 100V J	CMXA2A272J
C405	602150-63	Cap, Mylar, 5600PF, 100V K	CMXA2A562K
C406	602150-39	Cap, Electro, 0.47MF, 50V RS	CEXE1H478A
C407	602150-65	Cap, Mylar, 0.015MF, 50V K	CMXA1H153K
C409	602150-41	Cap, Cera, 0.01MF, 50V Z	CCXE1H103Z
C410	602150-67	Cap, Electro, 4.7MF, 50V RS	CEXE1H479A
C411	602150-68	Cap, Electro, 10MF, 16V RS	CEXE1C100A
C414	602150-69	Cap, Cera, 1000PF, 50V K	CCXB1H102K
C416	602150-70	Cap, Cera, 1000MF, 500V RS	CCXB2H102K
*  • C417	602150-71	Cap, Mylar, 3900PF, 1.6KV J	CMXH3C392J
• C418	602150-72	Cap, Mylar, 0.3MF, 200V J	CMXA2D304J
C420	602150-73	Cap, Cera, 1000PF, 500V K	CCXB2H102K
• C421	602150-74	Cap, Electro, 10MF, 160V RS	CEXE2C100A
C422	602150-75	Cap, Cera, 10MF, 500V C	CCSL2H100C
C423	602150-76	Cap, Cera, 1500PF, 500V K	CCXB2H152K
C424	602150-77	Cap, Electro, 1000MF, 25V RS	CEXD1E102A
*  • C426	602150-78	Cap, Mylar, 5600PF, 1.6KV J	CMXH3C562J
C430	602150-79	Cap, Electro, 1MF, 160V RS	CEBE2C109A
C501	602150-41	Cap, Cera, 0.01MF, 50V Z	CCXF1H103Z
C502	602150-81	Cap, Cera, 10PF 50V D	CBSL1H100D
C503	602150-25	Cap, Electro, 1MF, 50V RS	CEXE1H109A
C505	602150-83	Cap, Electro, 0.47MF, 50V	CEXD1H478C
C506	602150-84	Cap, Cera, 120PF, 50V J	CBCH1H121J
C508	602150-41	Cap, Cera, 0.01MF, 50V Z	CCXF1H103Z
C509	602150-86	Cap, Cera, 20PF, 50V J	CBRH1H200J

Location	Commodore Part No.	Description	Vendor Part No.
C510	602150-87	Cap, Cera, 22PF, 50V J	CXCH1H220J
C511	602150-88	Cap, Cera, 68PF, 50V J	CXCH1H680J
C512	602150-89	Cap, Mylar, 0.022MF, 100V J	CMXM2A223J
C513	602150-41	Cap, Cera, 0.01MF, 50V Z	CCXF1H103Z
C514	602150-91	Cap, Cera, 150PF, 50V K	CCXB1H151K
C515	602150-91	Cap, Cera, 150PF, 50V K	CCXB1H151K
C518	602150-67	Cap, Electro, 4.7MF, 50V RS	CEXE1H479A
C519	602150-89	Cap, Mylar, 0.022MF, 100V J	CMXM2A223J
C520	602150-41	Cap, Cera, 0.01MF, 50V Z	CCXF1H103Z
C521	602150-41	Cap, Cera, 0.01MF, 50V Z	CCXF1H103Z
C523	602150-41	Cap, Cera, 0.01MF, 50V Z	CCXF1H103Z
C601	602150-24	Cap, Electro, 10MF, 16V RS	CEXE1C100A
C602	602151-00	Cap, Electro, 470MF, 16V RS	CEXE1C471A
C603	602151-01	Cap, Cera, 220PF, 50V K	CCXB1H221K
C604	602151-02	Cap, Mylar, 0.01MF, 100V K	CMXA2A103K
C605	602151-03	Cap, Electro, 47MF, 16V RS	CEXE1C470A
C606	602151-03	Cap, Electro, 47MF, 16V RS	CEXE1C470A
C607	602151-35	Cap, Electro, 470MF, 16V RS	CEXE1C471A
C608	602151-06	Cap, Electro, 100MF, 16V RS	CEXE1C101A
C609	602151-07	Cap, Cera, 150PF, 50V J	CXCH1H151J
C610	602151-31	Cap, Electro, 22MF, 16V RS	CEXE1C220A
C611	602151-09	Cap, Mylar, 0.068MF, 50V K	CMXA1H683K
C612	602151-10	Cap, Cera, 3000PF, 50V K	CCXB1H302K
C701	602151-11	Cap, Electro, 10MF, 16V RS	CEXE1C100A
C702	602151-11	Cap, Electro, 10MF, 16V RS	CEXE1C100A
C703	602151-11	Cap, Electro, 10MF, 16V RS	CEXE1C100A
C704	602151-14	Cap, Electro, 10MF, 50V RS	CEXE1H100A
C705	602151-15	Cap, Cera, 0.01MF, 50V Z	CCXF1H103Z
C706	602151-11	Cap, Electro, 10MF, 16V RS	CEXE1C100A
C707	602151-17	Cap, Cera, 27PF, 50V J	CXCH1H270J
C708	602151-18	Cap, Cera, 10PF, 50V C	CXCH1H100C
C801	602151-19	Cap, Cera, 4700PF, 500V K	CCXB2H472K
C802	602151-19	Cap, Cera, 4700PF, 500V K	CCXB2H472K
• C803	602151-21	Cap, Electro, 150MF, 400V FWS	CEDM2G151D
C804	602151-22	Cap, Mylar, 6800PF, 50V K	CMXM1H682K
• C806	602151-23	Cap, Electro, 2.2MF, 160V RS	CEXE2C229A
C807	602151-24	Cap, Cera, 0.01MF, 1KV K	CCXB3A103K
C811	602151-25	Cap, Cera, 680PF, 500V K	CCXB2H681K
• C812	602151-26	Cap, Electro, 100MF, 160V RS	CEXE2C101A
• C813	602151-26	Cap, Electro, 100MF, 160V RS	CEXE2C101A
C814	602151-28	Cap, Electro, 1000MF, 25V	CEBD1E102A
⚠ • C816	602151-29	Cap, Cera, 4700PF, DE1910E	CCYB3G472K
• C818	602151-30	Cap, Cera, 1500PF, 1KV K	CCXB3A152K
* ⚠ • C819	602151-31	Cap, L. Acrs, 0.47MF, 250VAC	CLJB2E474M
• C820	602151-32	Cap, Cera, 3300PF, DE7120F M	CCYB3G332M

Location	Commodore Part No.	Description	Vendor Part No.
⚠ • C821	602151-32	Cap, Cera, 3300PF, DE7120F M	CCYB3G332M
C824	602151-34	Cap, Mylar, 6800MF, 50V K	CMXM1H682K
• C825	602151-35	Cap, Electro, 10MF, 160V RS	CEXE2C100A
C826	602151-36	Cap, Electro, 100MF, 25V RS	CEXE1E101A
• C828	602151-37	Cap, Cera, 1000PF, 1KV K	CCXB3A102K
C829	602151-19	Cap, Cera, 4700PF, 500V K	CCXB2H472K
C830	602151-19	Cap, Cera, 4700PF, 500V K	CCXB2H472K
C901	602151-40	Cap, Cera, 390PF, 500V K	CCXB2H391K
C902	602151-41	Cap, Cera, 180PF, 500V K	CCXB2H181K
C903	602151-42	Cap, Cera, 390PF, 50V J	CXCH1H391J
DL201	602151-43	Coil, Delay Line	5MQ0000001
DL501	602151-44	Coil, Delay Line A	58Q4430008 58Q00000017
DM	602151-45	Conn Wafer	4859201120
DN	602151-46	Conn Assy	9970700036
• D013	602151-47	Diode, 1N4148	D1N4148--
• D015	602151-47	Diode, 1N4148	D1N4148--
• D201	602151-49	Diode, Zener, ZPD5 1V	DZPD5R1E--
• D202	602151-47	Diode, 1N4148	D1N4148--
• D203	602151-51	Diode, 1K34A	D1K34A--
• D204	602151-47	Diode, 1N4148	D1N4148--
• D205	602151-53	Diode, Zener, ZPD12E	DZPD12E--
• D206	602151-47	Diode, 1N4148	D1N4148--
• D207	602151-55	Diode, Zener, ZPD15E	DZPD15E--
• D208	602151-47	Diode, 1N4148	D1N4148--
• D209	602151-47	Diode, 1N4148	D1N4148--
• D252	602151-47	Diode, 1N4148	D1N4148--
• D301	602151-59	Diode, RH-1B	DRH1B----
• D303	602151-60	Diode, SS295G	DSS295G--
• D401	602151-47	Diode, 1N4148	D1N4148--
• D403	602151-59	Diode, RH-1B	DRH1B----
• D404	602151-60	Diode, SS295G	DS5295G--
* • D405	602151-64	Diode, Zener, ZPD 22E	DZPD22E--
* • D406	602151-59	Diode, RH-1B	DRH1B----
• D701	602151-47	Diode, 1N4148	D1N4148--
• D702	602151-47	Diode, 1N4148	D1N4148--
• D801	602151-68	Diode, 1N1888	D1N1888--
D802	602151-68	Diode, 1N1888	D1N1888--
• D803	602151-70	Diode, EUIZ (High Speed)	DEUIZ----
• D804	602151-70	Diode, EUIZ (High Speed)	DEUIZ----
• D806	602151-72	Diode, RU-2	DRU2----
• D807	602151-73	Diode, EU1	DEU1----
• D808	602151-68	Diode, 1S1888	D1N1888--
• D809	602151-68	Diode, 1S1888	D1N1888--
• D811	602151-76	Diode, EG01	DEG01----

Location	Commodore Part No.	Description	Vendor Part No.
● D812	602151-70	Diode, EUIZ (High Speed)	DEUIZ----
● D814	602151-71	Diode, RU1P	DRU1P----
● D901	602151-69	LED KLR-208E	DKLR208E--
● D902	602151-74	Diode, Zener ZPD33E	DZPD33E---
● FB401	602151-75	Coil Choke HC-4035	58C0000026
FM	602151-76	Conn Wafer 5045-04A	4859201020
FN	6021151-77	Conn AS	9970700033
⚠ ● F801	602151-48	Fuse SEMKO MF51 4A 250V TL	5FSGS4022L
F801A	602151-50	CLIP Fuse	8457415000
GM	602151-45	Conn Wafer 5045-03A	4859201120
GN	602151-52	Conn AS	9970700034
● I201	602151-78	IC, TA7698AP	ITA7698AP-
● I301	602151-79	IC, UPC1378H	IUPC1378H-
● I601	602151-80	IC, KTA7208	IKTA7208--
● I701	602151-81	IC, UPD4066BC	IUPD4066BC
● I801	602151-82	IC, STR54041	ISTR54041-
L402	602151-83	Coil Linearity	SMHC000011
L501	602151-84	Coil Peaking	58P100J029
L502	602151-85	Coil Peaking	58P221J075
L503	602151-86	Coil Peaking	58P330J045
L701	602151-86	Coil Peaking	58P330J045
⚠ ● L801	602151-88	Filter Line	5TPLF472-
⚠ ● L802	602151-89	Filter Line	5PLF3544-
● L805	602151-90	Coil Chock	5MC0000003
● L806	602151-91	Coil Chock	58C0000026
● L807	602151-91	Coil Chock	58C0000026
L808	602151-93	Coil Chock	5MC0000007
PM	602151-94	Conn Wafer	4859202420
PR801	602151-95	Posister	DPHHBG180M
P502	602151-96	Connector as	9970700038
● Q001	602151-97	TR, KTC1815-Y	TKTC1815Y-
● Q003	602151-98	TR, KTA1015-Y	TKTA1015Y-
● Q004	602151-98	TR, KTA1015-Y	TKTA1015Y-
● Q005	602151-98	TR, KTA1015-Y	TKTA1015Y-
● Q007	602151-01	TR, KTC1959	TKTC1959-
● Q202	602151-98	TR, KTA1015-Y	TKTA1015Y-
● Q203	602151-03	TR, KTC562Y	TKTC562Y-
● Q401	602151-04	TR, KTC2482	TKTC2482--
● Q402	602151-05	TR, 2SD1397	T2SD1397--
● Q701	602151-97	TR, KTC1815-Y	TKTC1815Y-
● Q703	602151-97	TR, KTC1815-Y	TKTA1815Y-
● Q704	602151-97	TR, KTC1815-Y	TKTC1815Y-
● Q705	602151-97	TR, KTC1959	TKTC1959--
● Q706	602151-01	TR, KTC1959	TKTC1959--
⚠ ● Q805	602151-12	TR, KTC2236 (AUTO)	TKTC2236--
⚠ ● Q806	602151-12	TR, KTC2236 (AUTO)	TKTC2236--

Location	Commodore Part No.	Description	Vendor Part No.
R053	602152-14	Res, Carbon Film 1/6W 1.2K OHM J	RD-AZ122J-
R101	602152-15	Res, Carbon Film 1/6W 68K OHM J	RD-AZ683J-
R102	602152-16	Res, Carbon Film 1/6W 15K OHM J	RD-AZ153J-
R103	602152-17	Res, Carbon Film 1/6W 39K OHM J	RD-AZ393J-
R104	602152-18	Res, Carbon Film 1/6W 820 OHM J	RD-AZ821J-
R118	602152-19	Res, Carbon Film 1/6W 1K OHM J	RD-AZ102J-
R119	602152-20	Res, Carbon Film 1/6W 100K OHM J	RD-AZ104J-
R120	602152-21	Res, Carbon Film 1/6W 390K OHM J	RD-AZ391J-
R121	602152-22	Res, Carbon Film 1/6W 820K OHM J	RD-AZ821J-
R122	602152-23	Res, Carbon Film 1/6W 100 OHM J	RD-AZ101J-
R123	602152-24	Res, Carbon Film 1/6W 1.6K OHM J	RD-AZ162J-
R124	602152-24	Res, Carbon Film 1/6W 1.6K OHM J	RD-AZ162J-
R125	602152-19	Res, Carbon Film 1/6W 1K OHM J	RD-AZ102J-
R205	602152-27	Res, Carbon Film 1/6W 1.5K OHM J	RD-AZ152J-
• R207	602152-28	Res, Semi Fixed CET 95A 5K OHM B	RV6317502A
R208	602152-29	Res, Carbon Film 1/6W 18K OHM J	RD-AZ183J-
R210	602152-24	Res, Carbon Film 1/6W 1.6K OHM J	RD-AZ162J-
R213	602152-31	Res, Carbon Film 1/6W 1.6K OHM J	RD-AZ162J-
R214	602152-32	Res, Carbon Film 1/6W 330K OHM J	RD-AZ331J-
R215	602152-33	Res, Carbon Film 1/6W 1.2K OHM J	RD-AZ122J-
R217	602152-34	Res, Carbon Film 1/6W 10K OHM J	RD-AZ103J-
• R220	602152-35	Variable Res, Rotary	5V1103003B
R221	602152-36	Res, Carbon Film 1/6W 5.1K OHM J	RD-AZ512J-
R222	602152-37	Res, Carbon Film 1/2W 10K OHM J	RD-2Z103J-
R223	602152-38	Res, Carbon Film 1/4W 180K OHM J	RD-4Z184J-
R224	602152-39	Res, Carbon Film 1/6W 470 OHM J	RD-AZ471J-
• R225	602152-40	Res, Carbon Film 1W 12K OHM J	RS01Z123J-
R226	602152-41	Res, Carbon Film 1/6W 5.6K OHM J	RD-AZ562J-
R227	602152-42	Res, Carbon Film 1W 33K OHM J	RD01F330J-
R228	602152-43	Res, Carbon Film 1/4W 470 OHM J	RD4Z471J-
R229	602152-33	Res, Carbon Film 1/6W 1.2K OHM J	RD-AZ122J-
R230	602152-45	Res, Carbon Film 1/6W 3.3K OHM J	RD-AZ332J-
R231	602152-46	Res, Carbon Film 1/6W 2.2K OHM J	RD-AZ222J-
R232	602152-23	Res, Carbon Film 1/6W 100 OHM J	RD-AZ101J-
• R233	602152-48	Variable Res, Rotary (C-C)	5V1501006B
R238	602152-49	Res, Carbon Film 1/6W 3.9K OHM J	RD-AZ392J-
R239	602152-50	Res, Carbon Film 1/6W 27K OHM J	RD-AZ273J-
R240	602152-51	Res, Carbon Film 1/4W 36K OHM J	RD-AZ363J-
R242	602152-52	Res, Carbon Film 1/6W 560K OHM J	RD-AZ564J-
R243	602152-53	Res, Carbon Film 1/6W 750 OHM J	RD-AZ751J-
R244	602152-54	Res, Carbon Film 1/6W 2.4K OHM J	RD-AZ242J-
R245	602152-55	Res, Carbon Film 1/6W 56K OHM J	RD-AZ563J-
R246	602152-58	Res, Carbon Film 1/6W 2.2M OHM J	RD-AZ225J-
R247	602152-16	Res, Carbon Film 1/6W 15K OHM J	RD-AZ153J-
R248	602152-20	Res, Carbon Film 1/6W 100K OHM J	RD-AZ104J-

Location	Commodore Part No.	Description	Vendor Part No.
R249	602152-34	Res, Carbon Film 1/6W 10K OHM J	RD-AZ103J-
R252	602152-62	Res, Carbon Film 1/6W 12K OHM J	RD-AZ123J-
R301	602152-63	Res, Carbon Film 1/6W 3K OHM J	RD-AZ302J-
R302	602152-54	Res, Carbon Film 1/6W 2.4K OHM J	RD-AZ242J-
R303	602152-65	Res, Carbon Film 1/6W 220 OHM J	RD-AZ221J-
R304	602152-34	Res, Carbon Film 1/6W 10K OHM J	RD-AZ103J-
R305	602152-67	Res, Semi Fixed 200K OHM B	RV6117204L
R306	602152-68	Res, Carbon Film 1/6W 240K OHM J	RD-AZ244J-
R307	602152-54	Res, Carbon Film 1/6W 2.4K OHM J	RD-AZ242J-
R308	602152-70	Res, Carbon Film 1/6W 39K OHM J	RD-AZ393J-
• R309	602152-71	Res, Semi Fixed 100K OHM B	RV6317104A
R310	602152-72	Res, Carbon Film 1/4W 4.7K OHM J	RD-4Z472J-
R311	602152-73	Res, Carbon Film 1/4W 2.2K OHM J	RD-4Z222J-
R312	602152-74	Res, Carbon Film 1/6W 33K OHM J	RD-AZ333J-
R313	602152-75	Res, Carbon Film 1/6W 47K OHM J	RD-AZ473J-
R314	602152-76	Res, Carbon Film 1/6W 82K OHM J	RD-AZ823J-
R315	602152-19	Res, Carbon Film 1/6W 1K OHM J	RD-AZ102J-
• R316	602152-78	Res, Fusible 1W 2.2 OHM J	RF01Z229J-
R317	602152-79	Res, Carbon Film 1/6W 270K OHM J	RD-AZ274J-
R318	602152-80	Res, Carbon Film 1/2W 560 OHM J	RD-2Z561J-
R319	602152-17	Res, Carbon Film 1/6W 39K OHM J	RD-AZ393J-
• R322	602152-82	Res, Fusible 1W 1 OHM J	RS01Z109J-
R324	602152-83	Res, Carbon Film 1/4W 560 OHM J	RD-4Z561J-
R325	602152-53	Res, Carbon Film 1/6W 750 OHM J	RD-AZ751J-
R326	602152-34	Res, Carbon Film 1/6W 10K OHM J	RD-AZ103J-
R327	602156-16	Res, Carbon Film 1/6W 8.2M OHM J	RD-AZ825J-
• R328	602152-77	Res, M-Oxide Film 1W 180 OHM J	RS01Z181J-
• R329	602156-17	Res, M-Oxide Film 1W 510 OHM J	RS01Z511J-
• R358	602156-18	Res, M-Oxide Film 1W 270 OHM J	RS01Z271J-
• R359	602156-19	Res, Semi Fixed 10K OHM B	RV6317103A
R360	602152-81	Res, Carbon Film 1/4W 330 OHM J	RD-4Z331J-
R361	602152-23	Res, Carbon Film 1/6W 100 OHM J	RD-AZ101J-
• R402	602156-20	Res, Fusible 1W 2.2 OHM J	RD-4Z561J-
R404	602152-84	Res, Carbon Film 1/6W 3.3K OHM J	RD-AZ332J-
R405	602152-85	Res, Carbon Film 1/6W 3.3K OHM J	RD-AZ332J-
R407	602152-74	Res, Carbon Film 1/6W 33K OHM J	RD-AZ333J-
R408	602152-16	Res, Carbon Film 1/6W 15K OHM J	RD-AZ153J-
R409	602152-88	Res, Semi Fixed 5K OHM B	RV6317502A
R410	602152-89	Res, Carbon Film 1/6W 330 OHM J	RD-AZ331J-
⚠ • R411	602152-90	Res, M-Oxide Film 2W 8.2K OHM J	RS02Z822J-
R412	602152-91	Res, Carbon Film 1/6W 1.8K OHM J	RD-AZ182J-
R413	602152-32	Res, Carbon Film 1/6W 330 OHM J	RD-AZ331J-
* ⚠ R414	602152-34	Res, Carbon Film 1/6W 10K OHM J	RD-AZ103J-
* ⚠ R415	602152-94	Res, Carbon Film 1/6W 120K OHM J	RD-AZ124J-
* ⚠ R416	602152-16	Res, Carbon Film 1/6W 15K OHM J	RD-AZ153J-

Location	Commodore Part No.	Description	Vendor Part No.
R417	602152-86	Res, Carbon Film 1/4W 4.7K OHM J	RD-4Z473J-
⚠ • R418	602152-87	Res, M-Oxide Film 3W 1.8K OHM J	RS03Z182J-
⚠ • R419	602156-13	Res, Carbon Film 1/2W 10 OHM J	RD-2Z100J-
• R420	602156-14	Res, Fusible 1/1W 1 OHM J	RF01Z109J-
• R421	602152-89	Res, Fusible 1/1W 1 OHM J	RF01Z109J-
• R423	602156-15	Res, M-Oxide Film 1/1 560 OHM J	RS01Z561J-
• R424	602152-92	Res, Fusible 1/1W 1 OHM J	RF01Z109J-
R425	602152-93	Res, Carbon Film 1/4W 1 OHM J	RD-4Z109J-
• R426	602156-12	Res, M-Oxide Film 1W 1.5 OHM J	RS01Z159J-
R501	602152-83	Res, Carbon Film 1/4W 560 OHM J	RD-4Z561J-
R502	602152-96	Res, Carbon Film 1/6W 1.5K OHM J	RD-AZ152J-
R503	602152-97	Res, Carbon Film 1/6W 510 OHM J	RD-AZ511J-
R505	602152-98	Res, Carbon Film 1/6W 330K OHM J	RD-AZ334J-
R506	602152-99	Res, Carbon Film 1/6W 200 OHM J	RD-AZ201J-
• R507	602153-00	Res, Semi Fixed 1K OHM B	RV6317102A
R508	602153-01	Res, Carbon Film 1/6W 20K OHM J	RD-AZ203J-
• R509	602153-02	Variable Res, Rotary	5V11030038
R510	602153-03	Res, Carbon Film 1/6W 390 OHM J	RD-AZ39J-
R512	602152-18	Res, Carbon Film 1/6W 820 OHM J	RD-AZ821J-
R514	602152-32	Res, Carbon Film 1/6W 330 OHM J	RD-AZ331J-
R515	602153-06	Res, Carbon Film 1/6W 2.7K OHM J	RD-AZ272J-
R516	602152-32	Res, Carbon Film 1/6W 330 OHM J	RD-AZ331J-
R517	602153-08	Res, Carbon Film 1/6W 2.7K OHM J	RD-AZ272J-
R518	602152-32	Res, Carbon Film 1/6W 330 OHM J	RD-AZ331J-
R519	602153-08	Res, Carbon Film 1/6W 2.7K OHM J	RD-AZ272J-
• R521	602152-88	Res, Semi Fixed 5K OHM J	RV6317502A
R522	602153-08	Res, Carbon Film 1/6W 27K OHM J	RD-AZ272J-
R523	602152-33	Res, Carbon Fil 1/6W 1.2K OHM J	RD-AZ122J-
R524	602152-50	Res, Carbon Film 1/6W 27K OHM J	RD-AZ273J-
R525	602152-76	Res, Carbon Film 1/6W 82K OHM J	RD-AZ823J-
R528	602153-16	Res, Carbon Film 1/6W 560 OHM J	RD-AZ561J-
• R601	602153-17	Variable Res, Rotary	5511025B
R603	602152-74	Res, Carbon Film 1/6W 33K OHM J	RD-AZ333J-
R604	602152-74	Res, Carbon Film 1/6W 33K OHM J	RD-AZ333J-
R605	602153-20	Res, Carbon Film 1/6W 270 OHM J	RD-AZ271J-
R606	602152-75	Res, Carbon Film 1/6W 47K OHM J	RD-4Z473J-
R607	602152-75	Res, Carbon Film 1/6W 47K OHM J	RD-4Z473J-
R608	602152-23	Res, Carbon Film 1/6W 100 OHM J	RD-AZ101J-
R609	602152-23	Res, Carbon Film 1/6W 100 OHM J	RD-AZ101J-
R610	602152-50	Res, Carbon Film 1/6W 27K OHM J	RD-AZ273J-
R701	602153-26	Res, Carbon Film 1/6W 82 OHM J	RD-AZ820J-
R702	602153-26	Res, Carbon Film 1/6W 82 OHM J	RD-AZ820J-
R703	602153-26	Res, Carbon Film 1/6W 82 OHM J	RD-AZ820J-
R704	602153-26	Res, Carbon Film 1/6W 82 OHM J	RD-AZ820J-
R705	602152-23	Res, Carbon film 1/6W 100 OHM J	RD-AZ101J-

Location	Commodore Part No.	Description	Vendor Part No.
R706	602152-62	Res, Carbon Film 1/6W 12K OHM J	RD-AZ123J-
R707	602152-94	Res, Carbon Film 1/6W 120K OHM J	RD-AZ124J-
R708	602152-62	Res, Carbon Film 1/6W 12K OHM J	RD-AZ123J-
R709	602152-94	Res, Carbon Film 1/6W 120K OHM J	RD-AZ124J-
R710	602152-62	Res, Carbon Film 1/6W 12K OHM J	RD-AZ123J-
R711	602152-94	Res, Carbon Film 1/6W 120K OHM J	RD-AZ124J-
R712	602152-34	Res, Carbon Film 1/6W 10K OHM J	RD-AZ103J-
R713	602152-19	Res, Carbon Film 1/6W 1K OHM J	RD-AZ102J-
R714	602152-20	Res, Carbon Film 1/6W 100K OHM J	RD-AZ104J-
R715	602152-50	Res, Carbon Film 1/6W 27K OHM J	RD-AZ273J-
R716	602152-41	Res, Carbon Film 1/6W 5.6W OHM J	RD-AZ562J-
R717	602153-42	Res, Carbon Film 1/6W 680 OHM J	RD-AZ681J-
R718	602153-43	Res, Carbon Film 1/6W 180 OHM J	RD-AZ181J-
R719	602153-16	Res, Carbon Film 1/6W 560 OHM J	RD-AZ561J-
R720	602152-34	Res, Carbon Film 1/6W 10K OHM J	RD-AZ103J-
R721	602152-19	Res, Carbon Film 1/6W 1K OHM J	RD-AZ102J-
R722	602152-34	Res, Carbon Film 1/6W 10K OHM J	RD-AZ103J-
R723	602152-34	Res, Carbon Film 1/6W 10K OHM J	RD-AZ103J-
R724	602152-94	Res, Carbon Film 1/6W 120K OHM J	RD-AZ124J-
R725	602152-34	Res, Carbon Film 1/6W 10K OHM J	RD-AZ103J-
R726	602152-19	Res, Carbon Film 1/6W 1K OHM J	RD-AZ102J-
R727	602152-99	Res, Carbon Film 1/6W 200 OHM J	RD-AZ201J-
R728	602152-99	Res, Carbon Film 1/6W 200 OHM J	RD-AZ201J-
R729	602153-08	Res, Carbon Film 1/6W 2.7K OHM J	RD-AZ272J-
R730	602153-20	Res, Carbon Film 1/6W 270 OHM J	RD-AZ271J-
⚠ • R801	602153-56	Res, Cement 10W 3.3 OHM J	RX10B229JE
R802	602153-57	Res, Carbon Film 1/2W 240K OHM J	RD-2Z244J-
R803	602153-57	Res, Carbon Film 1/2W 240K OHM J	RD-2Z244J-
• R804	602153-59	Res, M-Oxide Film 2W 27 OHM J	RS02Z270J-
• R805	602153-60	Res, M-Oxide Film 2W 0.27 OHM J	RS02Z278J-
• R806	602153-61	Res, M-Oxide Film 3W 68K OHM J	RS03Z683J-
R807	602153-62	Res, Carbon Film 1/4W 10 OHM J	RD-4Z100J-
R808	602152-73	Res, Carbon Film 1/4W 2.2K OHM J	RD-4Z222J-
R809	602153-64	Res, Carbon Film 1/4W 100 OHM J	RD-4Z101J-
R810	602153-65	Res, Carbon Film 1/2W 6.8M OHM J	RD-2Z685J-
• R811	602153-66	Res, M-Oxide Film 2W 33 OHM J	RS02Z330J-
R812	602153-67	Res, Carbon Film 1/4W 150 OHM J	RD-4Z151J-
830	602153-68	Res, Fusible 1/1W 1 OHM J	RF01Z109J-
R901	602153-69	Res, Semi Fixed 10K OHM B	RV6117103E
R902	602152-62	Res, Carbon Film 1/6W 12K OHM J	RD-AZ123J-
R903	602152-16	Res, Carbon Film 1/6W 15K OHM J	RD-AZ153J-
R904	602153-72	Res, Semi Fixed 20K OHM B	RV6117203E
SP	602153-73	Speaker 16 OHM 0.5W	4858302220
• SW701	602153-74	SW Slide KSA-2317	5S30306002
⚠ • T301	602153-75	Trans Pin Cush	5TDU0000006

Location	Commodore Part No.	Description	Vendor Part No.
● T401	602153-76	Trans H Drive	5TD0000010
*  ● T461	602153-77	Trans FBT	5TH0000050
T501	602153-78	Coil Demodulator	58J0000003
T502	602153-78	Coil Demodulator	58J0000003
 ● T801	602153-79	Trans Switching	5RM0000003
X502	602153-80	Crystal, HC-18U 4.433619MHZ	5PHC18U3--
Y001	602153-81	Plate A Heat Sink	4857015700
Y001A	602153-82	Screw Tapping	7121300811
Y002	602153-83	Plate B Heat Sink	4857015800
Y002A	602153-84	Screw Tapping	7121300811
Y003	602153-85	Heat Sink A	4857013200
Y003A	602153-86	Screw Tapping	7121301211
1-2A	602153-87	Terminal Wrap	4857412900
1-3	602153-88	Pin B Term Pres	485741600
00020	602153-89	PCB CRT ASSY	997A100003
A1	602153-90	PCB CRT	9979800015
C555	602151-24	Cap, Cera, 0.01MF, 1KV K	CCXB3A103K
C556	602150-69	Cap, Cera, 1000PF, 50V K	CCXBIH102K
C557	602150-69	Cap, Cera, 1000PF, 50V K	CCXBIH102k
C558	602150-69	Cap, Cera, 1000PF, 50V K	CCXBIH102K
GM	602153-95	Conn Wafer	4859201420
GN	602153-96	Conn Wafer	4859201120
● Q554	602153-97	TR, KTC2068	TKTC2068--
● Q555	602153-97	TR, KTC2068	TKTC2068--
● Q556	602153-97	TR, KTC2068	TKTC2068--
R552	602153-67	Res, Carbon Film, 1/4W 150 OHM J	RD-4Z151J-
R553	602153-67	Res, Carbon Film, 1/4W 150 OHM J	RD-4Z151J-
R554	602154-02	Res, Semi Fixed, 5K OHM B	RV6117502A
R555	602154-03	Res, Semi Fixed, 300 OHM B	RV6117301A
R557	602153-67	Res, Carbon Film, 1/4W 150 OHM J	RD-4Z151J-
R558	602153-67	Res, Carbon Film, 1/4W 150 OHM J	RD-4Z151J-
R559	602154-02	Res, Semi Fixed, 5K OHM B	RV6117502A
R560	602154-07	Res, Carbon Film, 1/4W 120 OHM J	RD-4Z121J-
R562	602153-67	Res, Carbon Film, 1/4W 150 OHM J	RD-4Z151J-
R563	602153-67	Res, Carbon Film, 1/4W 150 OHM J	RD-4Z151J-
R584	602154-02	Res, Sami Fixed, 5K OHM B	RV6117502A
R565	602154-03	Res, Semi Fixed, 300 OHM B	RV6117301A
R566	602154-12	Res, Carbon Film 1/2W 2.7K OHM J	RD-2Z272J-
● R567	602154-13	Res, M-Oxide Film 2W 6.8K OHM J	RS02Z682J-
R568	602154-12	Res, Carbon Film 1/2W 2.7K OHM J	RD-2Z272J-
● R569	602154-13	Res, M-Oxide Film 2W 6.8K OHM J	RS02Z682J-
R507	602154-12	Res, Carbon Film 1/2W 2.7K OHM J	RD-2Z272J-
● R571	602154-13	Res, M-Oxide Film 2W 6.8K OHM J	RS027682J-
R572	602154-18	Res, Carbon Film 1/4W 1.5K OHM J	RD-4Z152J-
R573	602154-18	Res, Carbon Film 1/4W 1.5K OHM J	RD-4Z153J-

Location	Commodore Part No.	Description	Vendor Part No.
R574	602154-18	Res, Carbon Film 1/4W 1.5K OHM J	RD-4Z152J-
V501	602154-21	Socket CRT	4859301030
00030	602154-22	Mask Front as	9971010001
*  • V901	602154-20	CRT 370GGB22-TC12(SY)	4859603041
00010	602154-23	Mask Front	9972010101
00020	602154-24	PETA C BACK COV	4853311101
00030	602154-25	Mask Brand	9975610000
00040	602154-26	Leg Front	9972710000
00120	602154-27	Stopper Cord	4853516801
00130	602154-28	Screw Tapping	7121301211
00140	602154-29	Washer CRT Fix	4856213200
00150	602154-30	Washer Rubber	4856213400
00160	602154-31	Screw Tapping	7122502011
00170	602154-32	Retainer PCB	4853719801
00180	602154-33	Screw Tapping	7121401411
00190	602154-34	Door VR	4852800700
00200	602154-35	Deco Control	4855028705
00220	602154-36	CRT 370EGB22-TC12(SY) P38	4859603041
00230	602154-37	CRT Ground as Spring Coil Wire Net	486A145600
00240	602154-38	Spring Coil	4856716200
00250	602154-39	Wire Net	2301901040
00260	602154-40	Coil Degaussing	58G0000020
00270	602154-41	Knob Slide	9974710000
00280	602154-42	LED PCS	9979800028
00040	602154-43	Brkt push SW AS	9971510000
00010	602154-44	Knob Power	9974910100
00020	602154-45	Power Bracket	9973210200
00030	602154-46	Power Indicator	9975710000
00040	602154-47	Screw Tapping	7121301211
00050	602154-47	Screr Tapping	7121301211
00051	602154-47	Screw Tapping	7121301011
00060	602154-50	SW Push	5S40402137
00050	602154-51	Cover Back Assy	9851405211
00010	602154-52	Cover Back	4852116801
00030	602154-47	Screw Tapping	7122401411
00040	602154-54	Sped Plate	48554105JR
00050	602154-55	Plate A Insu	4857610000
00060	602154-56	Leg Rear	9972710100
00070	602154-47	Screw Tapping	7122401411
00060	602154-58	Packing Assy	9851705311
00010	602154-59	Pad Up	4858131000
00020	602154-60	Pad Up	4858131001
00030	602154-61	Pad Down	4858131100
00040	602154-62	Bag P.E.	4858212500

<b>Location</b>	<b>Commodore Part No.</b>	<b>Description</b>	<b>Vendor Part No.</b>
00050	602154-63	Carton Box (DW-2)	4858019910
00070	602154-64	Terminal Board Assy	9971610001
0001	602154-65	Terminal Ant	4853618903
0001	602154-66	Resin Hips	2221110202
0002	602154-67	Retainer F.B.T	4853727100
0004	602154-68	Screw Tapping	7121301011
00080	602156-10	Accessory Assy	997A100045
00020	905106-11	Signal Cable	9970700093
00030	252503-01	User's Guide	9978600005
	602154-66	Service Manual 1802 PAL	

## **SERVICE MANUAL**

**MODEL 1802 MONITOR (PAL)**

**OCTOBER, 1988**

**PN-602154-66**

 **commodore**  
**COMPUTERS**

# **SERVICE MANUAL**

## **MODEL 1802 MONITOR (PAL)**

**OCTOBER, 1988**

**PN-602154-66**

**Commodore Business Machines, Inc.**  
1200 Wilson Drive, West Chester, Pennsylvania 19380 U.S.A.

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# 1. IMPORTANT SERVICE SAFETY INFORMATION

**WARNING:** An isolation transformer must be used between the AC supply and the AC plug of the color monitor before servicing or testing is performed on this monitor, since part of the chassis and the heat-sink are directly connected to one side of the AC line which could present a shock hazard.

The chassis of the monitor should never be connected to the ground.

Before servicing is performed, read all the precautions labelled on the CRT, chassis, and on the inside of the cabinet of this monitor.

## X-RAY RADIATION WARNING NOTICE

**WARNING:** PARTS WHICH INFLUENCE X-RAY RADIATION IN HORIZONTAL DEFLECTION, HIGH VOLTAGE CIRCUITS AND PICTURE TUBE, ETC., ARE INDICATED BY (\*) IN THE PARTS LIST. FOR REPLACEMENT PURPOSES, USE ONLY THE TYPE SHOWN IN THE PARTS LIST.

## PRODUCT SAFETY NOTICE

**WARNING:** FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER RECOMMENDED PARTS. THESE PARTS ARE IDENTIFIED BY SHADING AND BY (Δ) ON THE SCHEMATIC DIAGRAM.

\*\*\*\*\*

## NOTICE D'AVERTISSEMENT DE RADIATION AUX RAYONS X

**AVERTISSEMENT:** LES PIECES QUI INFLUENT LES RAYONS X AU COURS DE LA DEVIATION HORIZONTALE, LES CIRCUITS A HAUTE TENSION ET LE TUBE-IMAGE, ETC. SONT ACCOMPAGNEES D'UN ASTERIQUE (\*) DANS LE CATALOGUE DE PIECES DETACHEES. DANS LE CAS D'UN REMPLACEMENT, UTILISER UNIQUEMENT LES MODELES DE PIECES INDIQUES DANS LE CATALOGUE DE PIECES DETACHEES.

## NOTICE DE SECURITE

**AVERTISSEMENT:** POUR ETRE ASSURE D'UNE SECURITE OPTIMENT A TOUT MOMENT, REMPLACER LES COMPOSANTS CRITIQUES UNIQUEMENT PAR LES PIECES RECOMMANDÉES PAR LE FABRICANT DE L'APPAREIL, CES PIECES SONT IDENTIFIÉES PAR UNE ZONE D'OMBRE ET PAR LE SYMBOLE (Δ) SUR LE SCHEMA DE MONTAGE.

The manufacturer's warranty and liabilities will be void if any unauthorized modifications, alterations or additions are made.

For replacement purposes, use the same type or specified type of wire and cable, ensuring that the positioning of the wires is followed (especially for H.V. and power supply circuits). Use of alternative wiring or positioning could result in damage to the set or in a shock or fire hazard.

The picture tube used in this monitor employs integral implosion protection and should be replaced with the tube of the same type number for continued safety.

When handling the CRT, shatter-proof goggles must be worn after completely discharging the high voltage circuit. Do not lift the picture tube by the neck.

**WARNING:** BEFORE RETURNING THE MONITOR TO THE CUSTOMER PERFORM THE FOLLOWING SAFETY CHECKS IN ITEMS 1, 2 AND 3 FOR THE CONTINUED SAFETY OF THE SERVICEMAN AND CUSTOMER.

\*\*\*\*\*

**AVERTISSEMENT:** AVANT DE RETOURNER LE MONITEUR AU CLIENT, PROCÉDER AUX CONTROLES DE SECURITE DES ITEMS 1, 2 ET 3 POUR ASSURER UNE SECURITE OPTIMUM AU REPARATEUR COMME AU CLIENT.

### 1. Leakage Current Test:

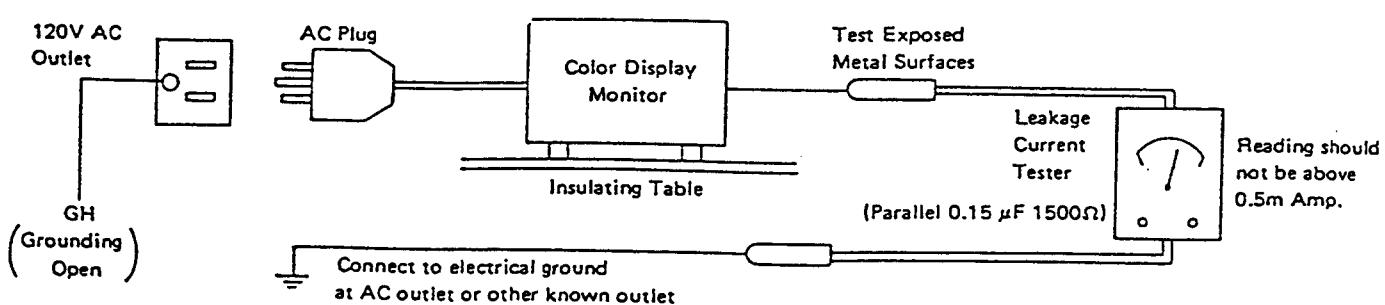
Plug the AC power cord directly into a 120V AC outlet (Do not use an isolation transformer for this test)

Use a Leakage Current Tester or a metering system which complies with Underwriters Laboratories (UL 478 Para 20) or CSA (C22.2 No. 154 Para 6).

Measure the current flowing from all exposed metal parts of the cabinet, including the rear cover, (handle bracket, wooden cabinet, screw heads, video input terminal, control shaft, etc.) to the ground pin of an AC outlet or to a known ground (water-pipe, conduit, etc.)

This leakage test should be performed with the AC switch ON and repeated with the AC switch OFF. The measured current must be less than 0.5 milliamp.

Any measurements not within the limits outlined above are indicative of a potential shock hazard and corrective action must be taken before returning the instrument to the customer.



### AC Leakage Test

### 2. Resistance Test:

With the AC plug is removed from the 120VAC outlet, place a jumper across the two attachment plug prongs except Grounding Pin. Turn the switch ON. Using an ohmmeter, connect one lead to the jumped AC plug and touch the other lead to each exposed video input terminal, and to any exposed metal parts. The resistance measured should not be less than 1.0 megohm or greater than 5.2 megohms. Any resistance value below or above this range indicates an abnormality which requires corrective action. Repeat the test with the AC switch in the OFF position.

### 3. Wire Routine:

In case of removing Wire Clamp during service, make sure to return Clamp and Wiring routes to original positions after servicing.

# 1. SPECIFICATIONS

CRT .....	13V inch 90° in-line, ±62mm dot pitch, gray face.	Video band width .... COMPOSITE: 3.5 MHz Separated video(luma&chroma): 4.2 MHz Mono Video: 4.2 MHz
Input signals .....	NTSC Composite, Separated video (luma & chroma)- MONOCHROME VIDEO, Audio I AUDIO II	Scanning frequency .... Horizontal: 15.75 kHz Vertical: 60 Hz
Input level .....		Audio .... Input: 1Vp-p/49KΩ Output: 0.5W
	Comp., Video, Chroma; Mono: 1Vp-p/75Ω	Dimensions .... 360(W) x 376(D) x 327.5(H) mm Weight .... Approx. 12 kg
Display size .....	233 (h) x 180 (v) mm	Power input .... 120 VAC, 60 Hz, 0.8A
Colors .....	Comp.: Full colors	Power consumption .... 60W
Resolution .....		
	Comp.: 1,000 characters (40 column x 25 lines)	

\* Design, features and specifications are subject to change  
without notice.

## 2. INSTALLATION AND CHASSIS PARTS LOCATION

### 2-1 Installation of This Color Monitor Chassis and Initial Check Points

When installing this color monitor chassis, first check operation on a black and white telecast. Check, and if necessary, adjust centering, size, and focus. Observe the picture for proper black and white reproduction (tracking) over all areas of the screen. No objectionable color shading or fringing should be evident. If shading or fringing is evident, degauss the monitor.

In most instances after installation, a technician need only degauss the faceplate area and touch-up the static (center) convergence.

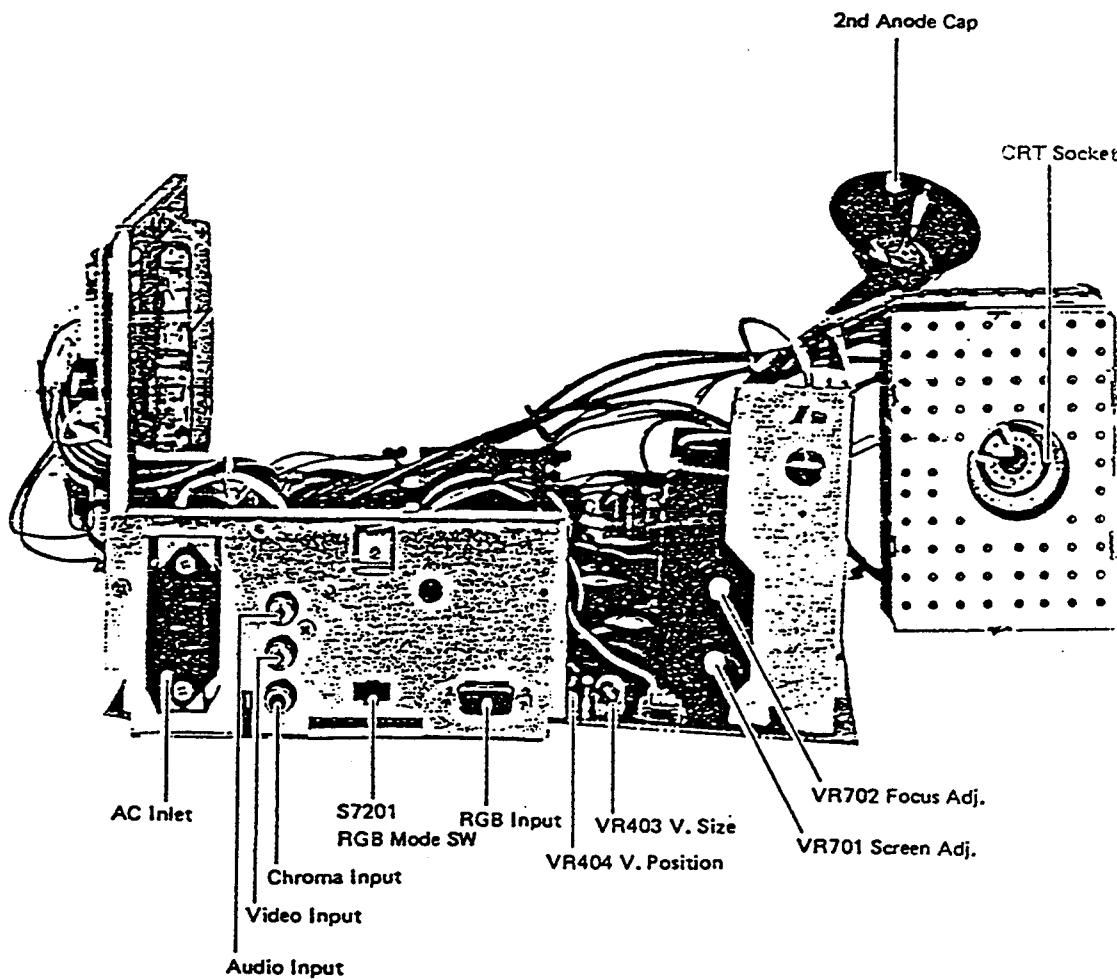
The degaussing coil should be moved slowly around the front faceplate of the picture tube and around the sides and front of the monitor. The coil should then be withdrawn slowly to a distance of at least six to ten feet before disconnecting from the AC supply.

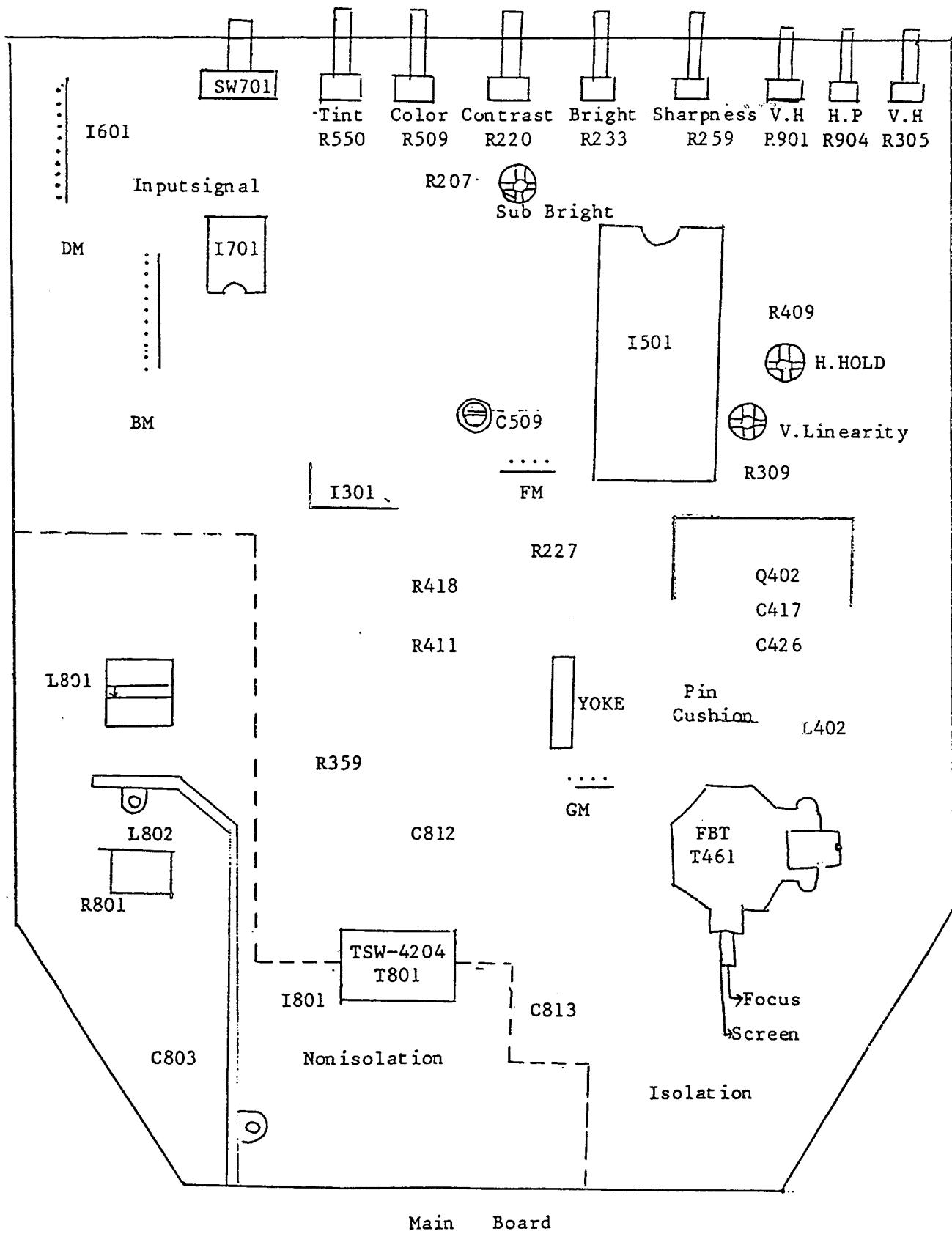
This monitor chassis is equipped with an automatic degaussing circuit which effectively demagnetizes the faceplate each time the monitor is switched ON after having been OFF for at least ten minutes.

#### Note:

See 'SERVICE ADJUSTMENT' on page 9 for details of adjusting procedures.

### 2-2 Chassis Parts Location





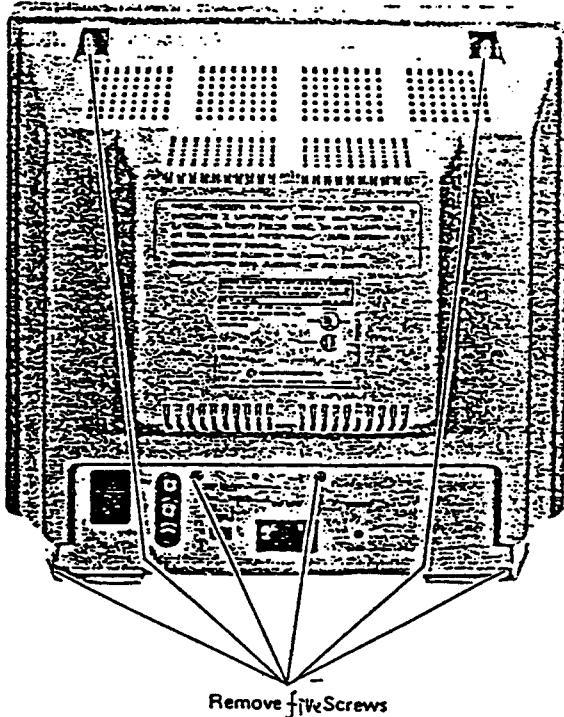
### 3. SERVICE INSTRUCTIONS

#### 3.1 Chassis Removal (See Figs. 3/4)

*five*

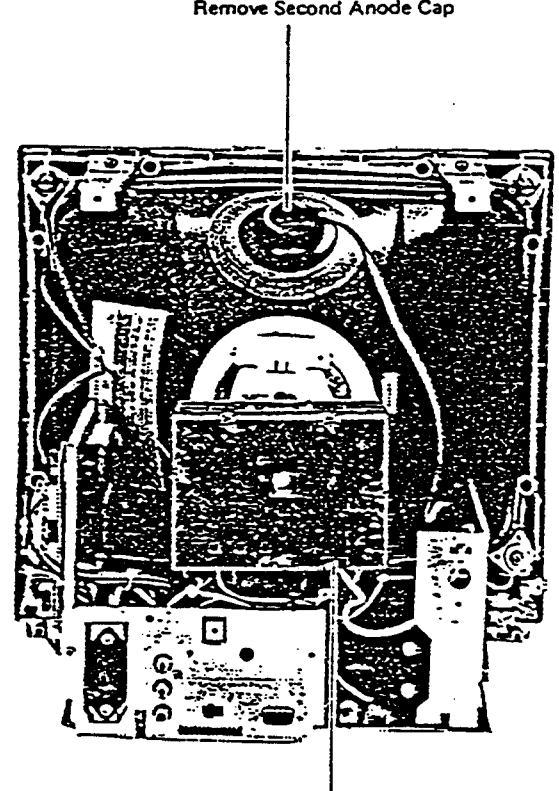
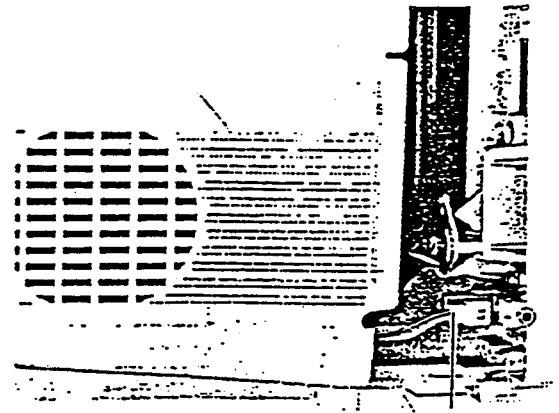
1. Remove the *five* screws securing the rear cover of the cabinet. (See Fig. 3)
2. Pull the rear cabinet about 10cm to the rear.

3. Remove the rear cabinet.
4. Remove solder connection of the black wire connecting CRT grounding and neck p.c. board, then remove the neck p.c. board from the picture tube. (See Fig. 5)
5. Remove the second anode cap.
6. Remove the connectors as follows:
  - 1) Deflection yoke connector
  - 2) Degaussing coil connector
- 3) Speaker connector
- 4) Power indicator connector
5. Remove the two screws securing the power switch.
6. Take the chassis out of the cabinet.
7. To install the chassis, repeat the above procedure in reverse order.



Remove *five* Screws

Fig. 3



Remove Second Anode Cap  
Remove Solder Connection of  
Black Wire from CRT Ground

Fig. 5

### 3.2 Main Chassis Servicing

1. Remove the rear cabinet.
2. Repairing of main chassis can be done easily, if stood as shown in Fig. 6.

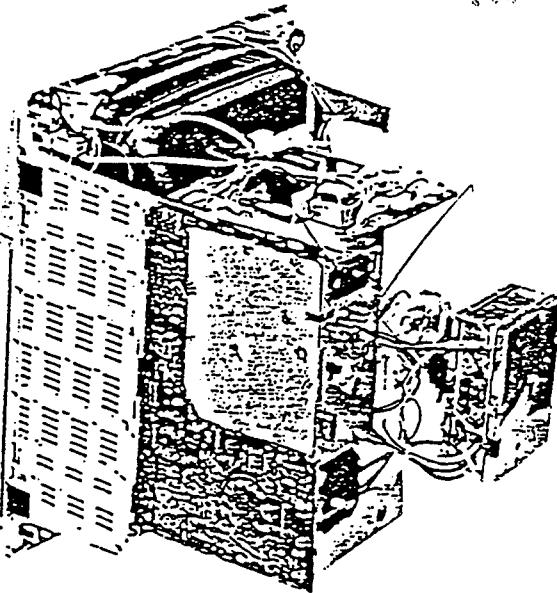
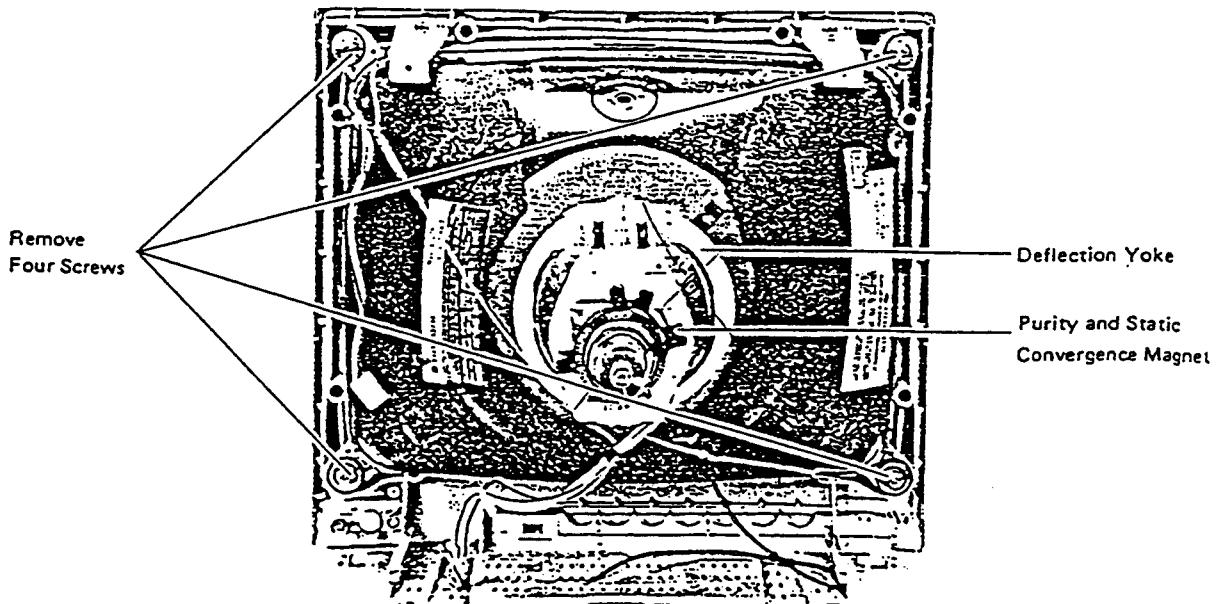


Fig. 6

### 3.3 Picture Tube Removal

In order to remove or replace the picture tube, the chassis must first be removed. Refer to Chassis Removal procedure. After the chassis has been removed, proceed as follows.

1. Loosen the clamping screws on the deflection yoke, purity and static convergence magnet, and remove them.
2. Remove four screws securing the picture tube to the front cabinet.



### 3.4 Precautions for Repairs

1. Check for bad contacts on connectors on the main PC board and elsewhere by applying hand pressure.
2. Check AC power supply for problems — e.g. blown fuse, bad switch or AC outlet.
3. Check for intermittents or defective soldering on the main board by striking the reverse side of the board gently with an insulated bar.
4. When soldering PC boards, limit the soldering iron temperature to 500°F (200°C) to avoid peeling of the foil.
5. When soldering transistors or other semiconductors, use tweezers or a heat sink clip as shown in Fig. 8 to prevent heat damage.

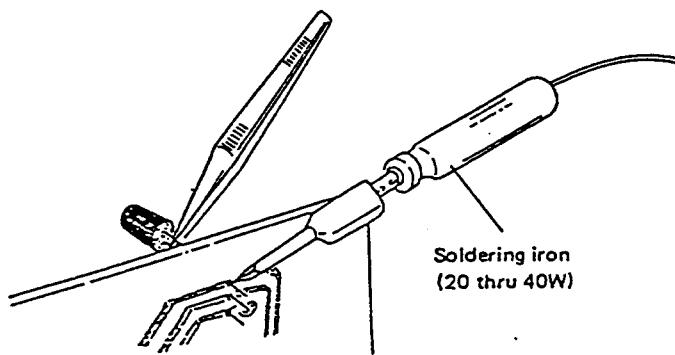


Fig. 8

### 3.5 Troubleshooting

As major parts of this chassis employ ICs, defects can often be isolated by referring to the table of symptoms in Table 1.

Additional checks of transistor and IC DC voltages and waveforms as shown on the schematic will assist in pinpointing the problem area. Remember also to check for faulty resistors and capacitors, etc. around defective ICs and transistors.

Table 1 IC/TR Failure and Symptoms

IC/TR	SYMPTOM
I 501: Video Chroma circuit  Vert./Horiz. osc., Drive/Sync. sep. circuit	Composite/Separate mode reception No picture and poor picture. No color and monochrome. Poor color synchronization. Hue discrepancy.  Vertical line only. No picture, No high voltage. Unstable picture.
I 301 : Vert. output circuit	Horizontal line only. Poor vertical scan.

IC/TR	SYMPTOM
I 801: S.M.P.S. circuit	No power (NO LED)
I 701 : Video interface circuit SW1	No picture or poor picture. Incorrect color.
I 601: Audio amp. circuit	No sound or poor sound
Q001 Q205 ~ Q207 Video amp. circuit	Composite/Separate mode / Mode No picture or poor picture.
Q208: 3.58MHz trap. circuit	Composite mode Small dotted stripes appear in the picture.
Q209: VIDEO DRIVE, OUTPUT CIRCUIT	Composite/Separate mode / Mode NO Video or poor video
Q202: Chroma amp. circuit	Separate mode No color or incorrect color.
Q204, Q205 VIDEO SHARPNESS	poor picture
Q359: Vertical position circuit	Incorrect vertical picture position.
Q401: Horiz. drive circuit	No picture Does not generate high voltage.
Q402: Horiz. output circuit	No picture, does not generate high voltage, fuse is blown.
Q202: ABL circuit	Dark or brighter picture.
Q553 Blue output circuit	No blue picture. Blue with retrace line picture.
Q552 Green output circuit	No green picture. Green with retrace line picture.
Q551 Red output circuit	No red picture. Red with retrace line picture.

### 3.6 Desoldering of ICs and TR

The following tools are suggested for desoldering semiconductors:

#### 1. Desoldering tools

- a) Hand suction type — Solder-Pull® (model SS011, Edsyn Inc., Van Nuys, CA.) or equivalent.
- b) Wire-Wick type — Solder-Wick® (size #4, Solder Removal Co., Covina, CA) or equivalent.

2. Soldering Iron — Maximum wattage recommended is 40W. Higher power soldering irons may damage the copper foil of board.

#### Note:

When desoldering parts, heat the joint and remove the solder quickly. The PC foil may peel from the board if heat is applied for too long.

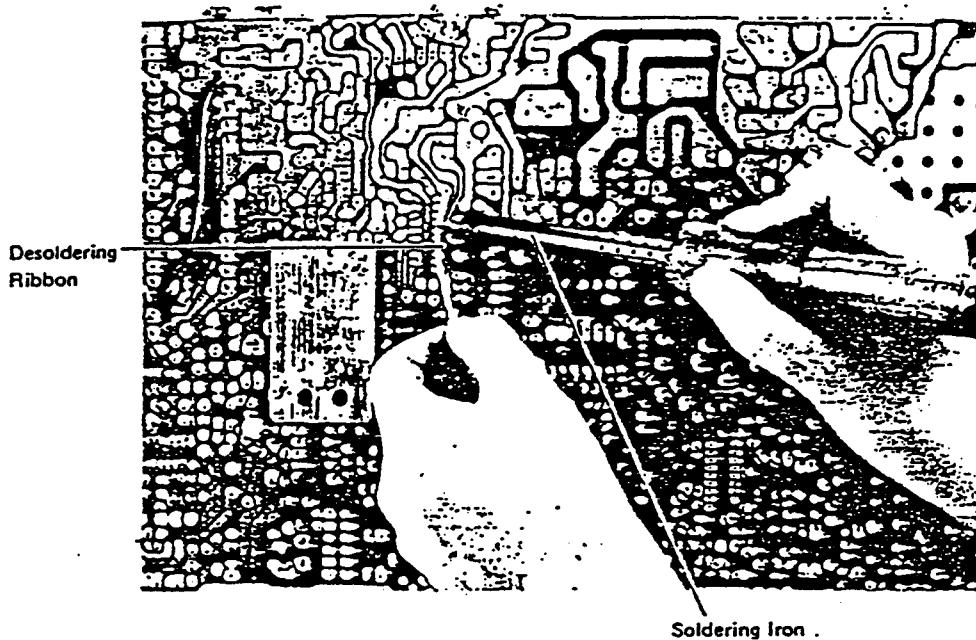


Fig. 9

## 4. SERVICE ADJUSTMENT

### 4.1 Focus Adjustment

Adjust the focus control, located on the H.V. unit (T461) for maximum overall definition and fine picture detail with brightness and contrast controls set at normal viewing levels.

### 4.2 Vertical Size ( R901 ) Adjustment

The vertical size (height) control is the screwdriver adjustment that is accessible through the front cover.

Location of the control is shown in Figs. 1 and 10.

These controls must be adjusted until the correct picture or test pattern is obtained.

### 4.3 Circuit Protection

A ~~4~~ 0A pigtail fuse, mounted on the main PC board, has been provided to protect the power output circuit. See Figs. 2 and 10.

### 4.4 Horizontal Hold ( R409 ) Adjustment (See Figs. 1 and 10)

Receive the color signal.

Set the brightness and contrast controls to a normal position. A warm-up period of at least five minutes should be allowed and alignment should be done.

- 1 Connect a capacitor ( $0.1 \sim 0.47 \mu F$ ) between Pin 31 of I501 and Ground
- 2 Connect a jumper wire between Pin 13 of I501 and  $\pm 12V$  Source Line
3. Adjust the horiz. hold control ( R409 ) until the picture is stable. (Tune R409 to 15.734 kHz). After adjustment, remove the

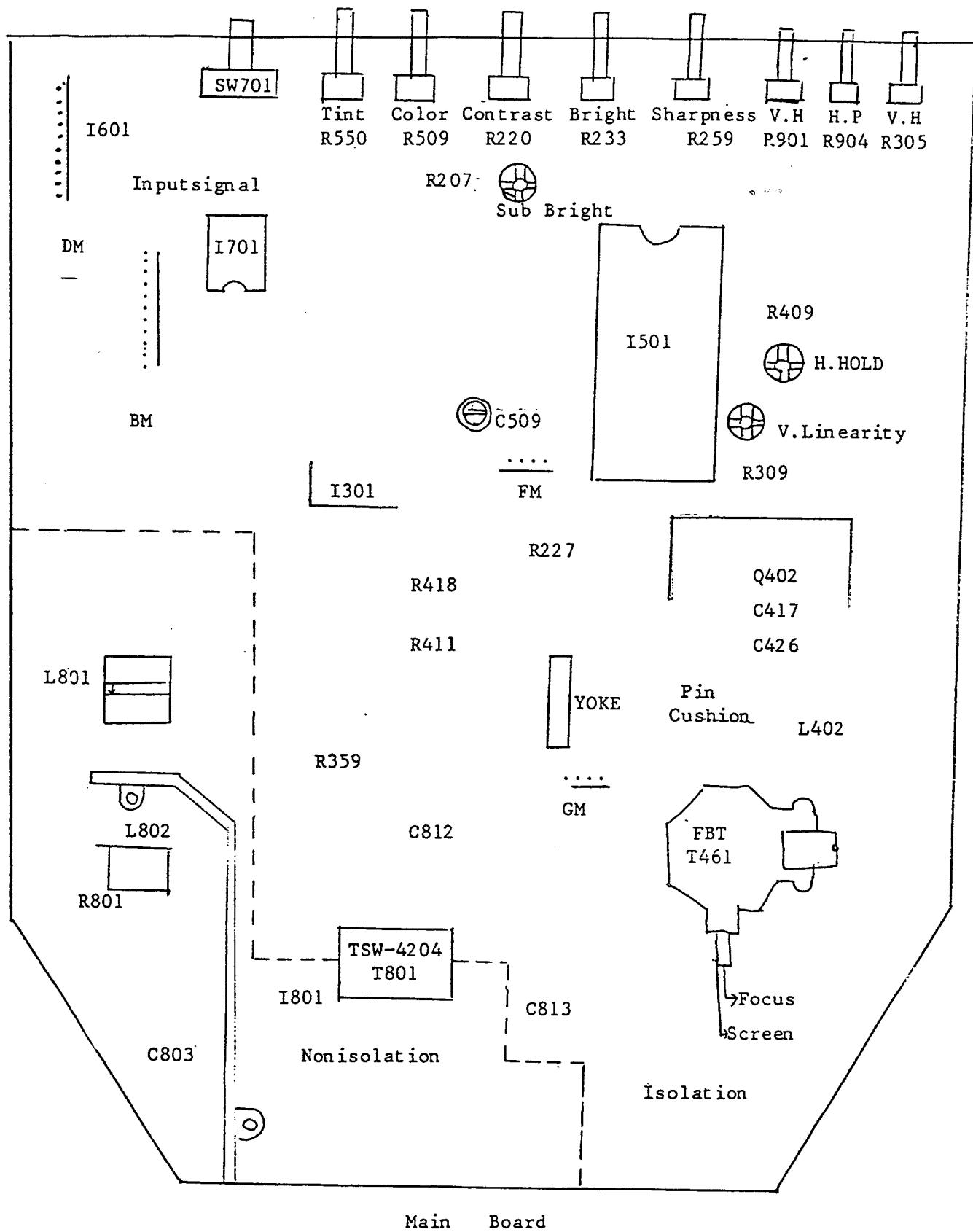


Fig. 10

#### 4.5 APC Adjustment (See Fig. 10)

This adjustment should be made only when the chroma/video IC (I501) or parts of the APC circuit have been replaced, or when the picture colors are unstable. For adjustment, use the APC ADJ. control (C509).

##### Procedures:

1. Apply a color bar signal to the video input terminal.
2. Turn the color control fully clockwise and position the tint control at the mechanical center.

3. Connect a capacitor ( $0.1 \sim 0.47 \mu F$ ) between pin 31 of I501 and Ground
4. Connect a jumper wire between pin 13 of I501 and +12V Source Line
5. Turn the APC ADJ. control (C509) with an insulated screwdriver until the color bar on the screen is synchronized.
6. Remove the jumper wire and capacitor

#### 4.6 High Voltage Check

High voltage is not adjustable but must be checked to verify that the monitor is operating within safe and efficient design limitations as specified:

1. Remove cabinet back.
2. Operate monitor for at least 15 minutes at 120V AC line with video signal or test signal properly tuned in.
3. Rotate the brightness and contrast controls to maximum clockwise position.
4. Connect an accurate high voltage meter to CRT anode.

Reading should be between 22.5 KV and 25 KV.

#### 4.6 Controle de Haute Tension

La haute tension n'est pas réglable mais doit être contrôlée afin de s'assurer que le moniteur fonctionne d'une mesure de sécurité et d'efficacité déterminée par le cahier des charges. Pour le faire:

1. Enlever le couvercle d'arrière du cabinet.
2. Faire fonctionner le moniteur pendant au moins 15 minutes à la ligne de 120V, C.A. en accordant correctement le signal de vidéo ou celui d'essai.
3. Tourner à fond les commandes de brillance et de contraste dans le sens des aiguilles d'une montre.
4. Brancher un voltmètre de haute précision sur l'anode de CRT. La valeur relevée doit être comprise entre 22.5 KV et 25 KV.

#### 4.7 Vertical Position Control(R359) Adjustment (See Fig. 10)

The vertical position control (R359) is the VR which controls the vertical position of the picture.

If the vertical position of the picture is not at the center of the picture tube, adjust the vertical position by turning this control.

#### 4.8 Vertical Linearity Control(R309) Adjusting (See Fig. 10)

The vertical linearity control (R309) is the VR which controls the vertical linearity of the picture.

After received cross hatch pattern, adjust the vertical linearity by turning this control.

#### 4.10 Composite Contrast Control ( R220) Adjustment

This is the composite contrast level adjustment control. It is adjusted at the factory.

When readjustment is required, proceed as follows:

1. Receive the composite video signal, such as H characters pattern.
2. Set the contrast, brightness, Color and Tint controls at the mechanical center position.
3. Adjust the composite contrast control so that normal contrast is obtained.

3. Pull the deflection yoke backward so that the magenta belt will appear. (See Fig. 11)
4. Move the two purity magnets and bring the magenta belt to the mechanical center of the screen. (See Fig. 11)

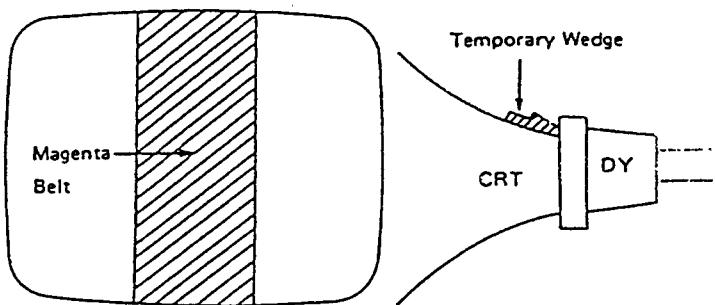


Fig. 11

5. Push the deflection yoke forward gradually and fix it at the place where the magenta screen becomes uniform throughout.
6. Turn the cut off control, and drive control and confirm that each color is uniform.
7. If the color is not uniform, re-adjust it by moving purity magnets slightly.
8. Move the pair of purity magnets at the same time (do not change the angle of the pair), and adjust the vertical center to center of screen.
9. Obtain the three colors and confirm whether white uniformity is balanced.
10. Insert the temporary wedge as shown in Fig. 11 and adjust the angle of deflection yoke.

#### 4.14 Static Convergence Adjustment

A recently developed deflection yoke and electron guns construction has been used on this equipment in combination with in-line guns and black stripe screen to make a barrel-type magnetic-field distribution for vertical deflection and a pin-cushion-type magnetic field for horizontal deflection with which a self-converging system can be obtained. This type is different from conventional unity magnetic field distribution type deflection yoke. 4-pole magnets and 6-pole magnets are employed for static convergence instead of a convergence yoke.

1. A crosshatch signal should be connected to the video input terminal of the monitor.
2. Set the contrast and brightness knobs to obtain a visible screen.
3. A pair of 4-pole convergence magnets are provided and adjusted to converge the blue and red beams. When the pole opens to the left and right 45° symmetrically, the magnetic field maximizes. Red and blue beams move to the left and right oppositely (See Figs. 12- (a) and 12- (b) ). Variation of the angle between the tabs adjusts the convergence of red and blue vertical lines. When both 4-pole convergence magnet tabs are rotated as a pair, the convergence of the red and blue horizontal lines is adjusted.

#### 4.12 Sub Brightness ( R223)

These controls are adjusted at the factory.

When readjustment is required, proceed as follows:

1. Receive H characters pattern at SEP mode.
2. Set the contrast and brightness controls at the mechanical center position.
3. Adjust the sub brightness control so that back ground of the picture is just disappeared.

#### 4.13 Color Purity and Vertical Centering Adjustment

For best results, it is recommended that the purity adjustment be made in the final receiver location. If the monitor will be moved, perform this adjustment with it facing east or west. The monitor must have been operating 15 minutes prior to this procedure and the faceplate of the CRT must be at room temperature.

The monitor is equipped with an automatic degaussing circuit. However, if the CRT shadow mask has become excessively magnetized, it may be necessary to degauss it with a manual coil. Do not switch the coil OFF while the raster shows any effect from the coil.

Purity magnets are used for color purity and vert. centering adjustment.

Purity adjustment procedure is as follows.

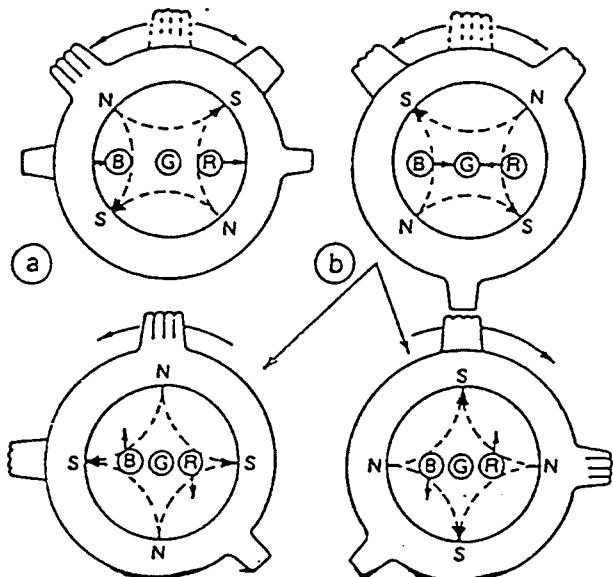
1. Set the brightness control to maximum.
2. Turn the green cut off control (VR252) on the neck board fully CCW.

Turn the red and blue cut off controls (VR253, VR251) fully CW.

4. A pair of 6-pole convergence magnets are also provided and adjusted to converge the magenta (red + blue) to green beams.

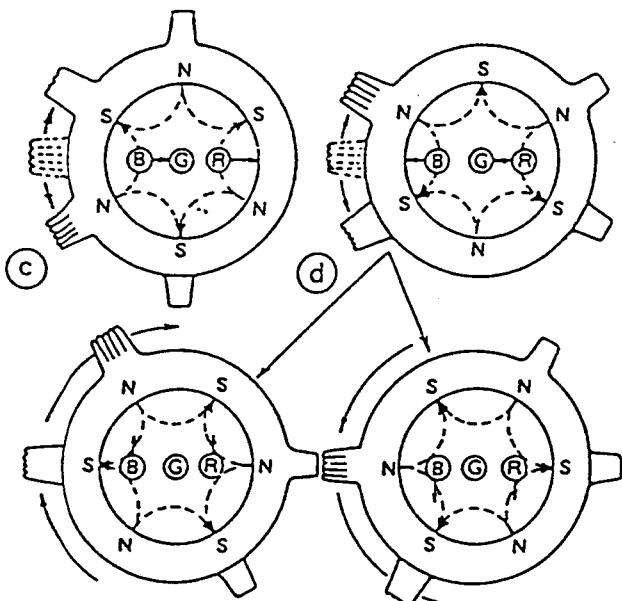
When the pole opens to the left and right  $30^\circ$  symmetrically, the magnetic field is maximized. Red and blue beams both move to the left and right. (See Figs. 13-(c) and 13-(d)).

Variation of the opening angle adjusts the convergence of magenta to green vertical lines. When both 6-pole convergence magnet tabs are rotated as a pair, the convergence of magenta to green horizontal lines is adjusted.



4-Pole Magnets and the Movement of Beams

Fig. 12



6-Pole Magnets and the Movement of Beams

Fig. 13

#### 4.15 Precise Adjustment of Dynamic Convergence (See Figs. 14 and 15)

1. Inject a crosshatch signal to the video input terminal.
2. Set the contrast and brightness knobs to obtain a visible screen.
3. Insert the temporary wedge and fix the deflection yoke so as to obtain the best circumference convergence. (See Fig. 15)

Note:

The temporary wedges may need to be moved during adjustments.

4. Insert three rubber wedges to the position as shown in Fig. 14 to obtain the best circumference convergence.

Note:

- 1) Tilting the angle of the yoke up and down adjusts the crossover of both vertical and horizontal red and blue lines. See Figs. 15(a) and 15(b).
- 2) Tilting the angle of the yoke sideways adjusts the parallel convergence of both horizontal and vertical lines at the edges of the screen. See Figs. 15(c) and 15(d).
- 3) Use three rubber wedges.
- 4) The angle of each rubber wedge is shown in Fig. 14.
- 5) After three rubber wedges with chloroprene rubber adhesive have been inserted, pull out the temporary wedge.

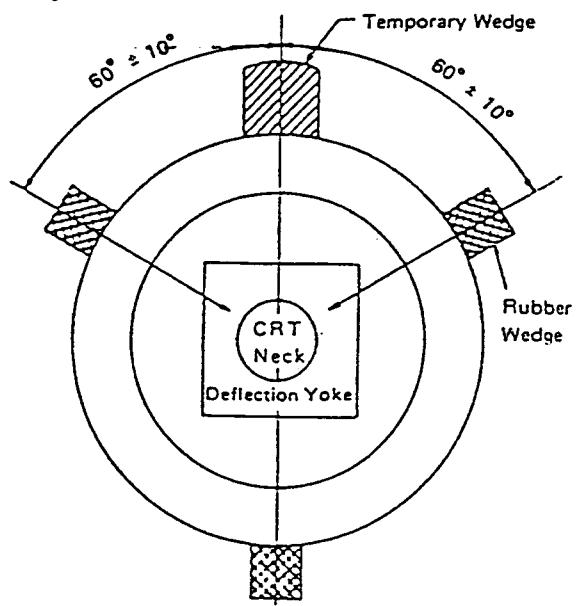


Fig. 14

#### 4.16 Black and White Tracking

The purpose of this procedure is to optimize the picture tube to obtain a good black and white picture at all brightness levels, while at the same time achieving maximum usable brightness. Normal purity adjustment must precede this procedure.

1. Set the Video mode switch to *SEP Mode* position.
2. Connect the black signal to *SEP* input terminal.

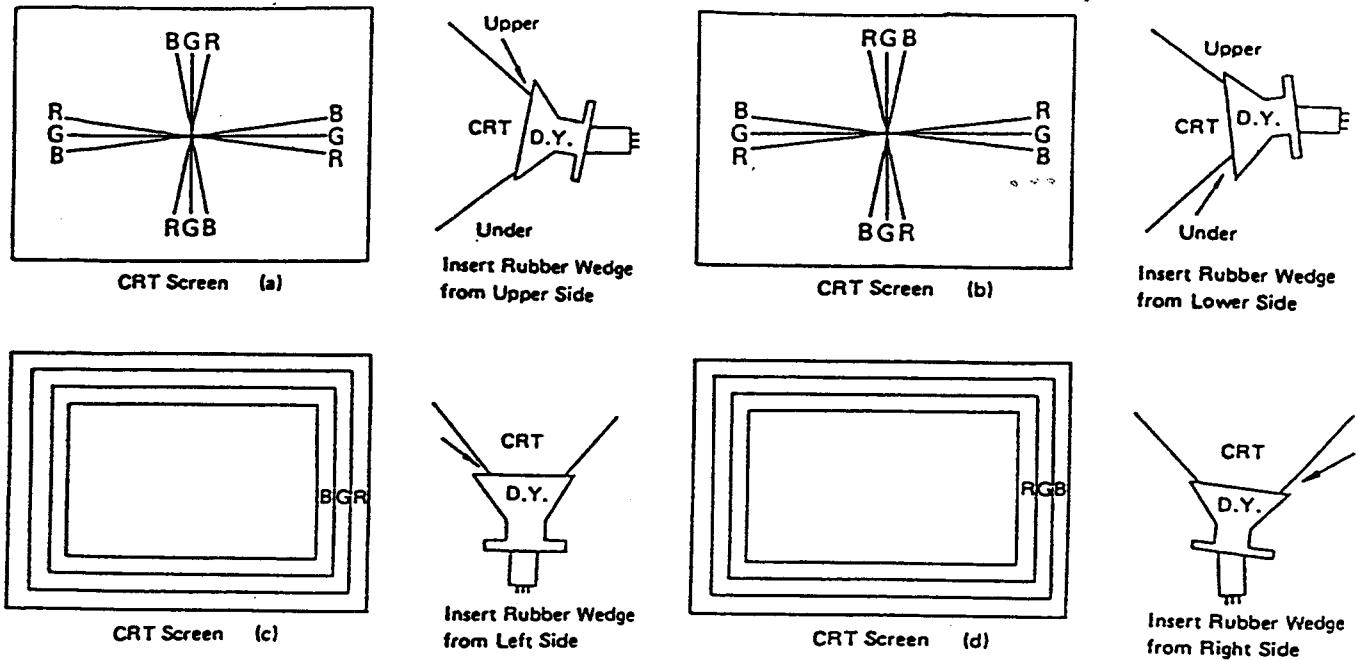


Fig. 15

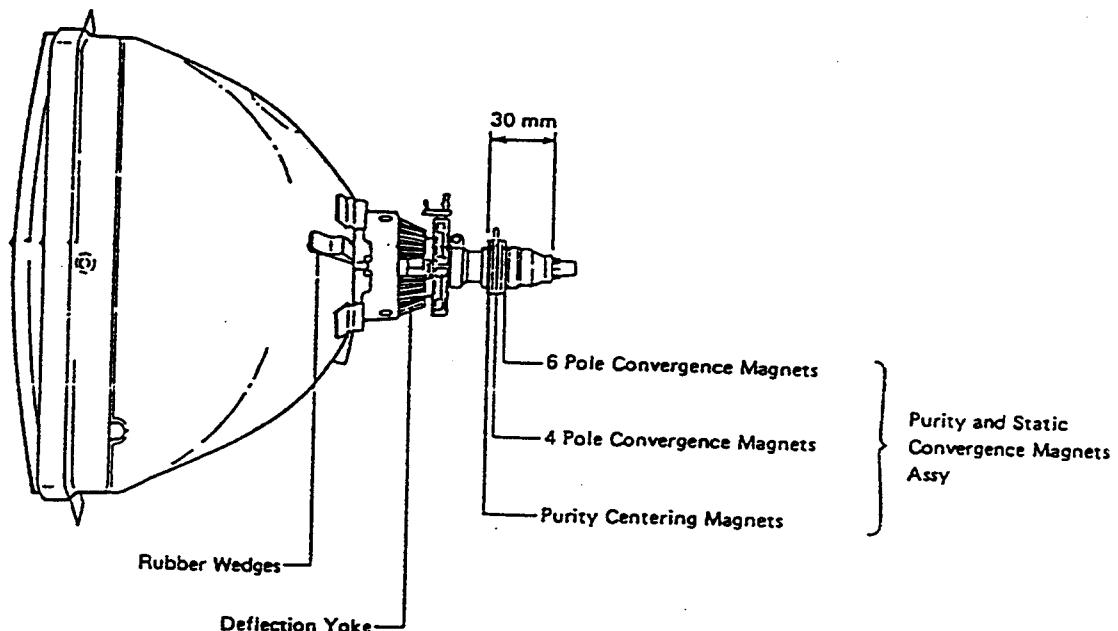


Fig. 16 Picture Tube Neck Components Location

3. Set the brightness and contrast control at the mechanical center position.
4. Rotate the red, green and blue cut off controls fully counter-clockwise.
5. Rotate the G. drive and R. drive controls to midrange.
6. Rotate screen VR fully counter-clockwise.
7. Short circuit G and H with a jumper Clip to produce a horizontal line.
8. Slowly turn the screen control on FBT clockwise until color (colors) appears faintly on the screen.
9. Adjust each cut-off control so that color becomes lightest and horizontal lines are turned to white color.
10. Remove the jumper Clip
11. Receive the white signal.
12. Adjust R/G drive controls ('R555, 565) to produce a hi-lite white screen.
13. Set the brightness and picture controls to minimum. Then, the raster should appear dark.
14. Move the brightness control until a dim raster is obtained.
15. If necessary, touch-up adjustment of the three cut off controls to obtain best white uniformity on the CRT screen.
16. Set the brightness and picture controls at the mechanical center position. If necessary, adjust the R. drive and G. drive controls to produce a uniform black and white picture.

## 5. SERVICE INFORMATION

### 5.1 Rear Connection Panel

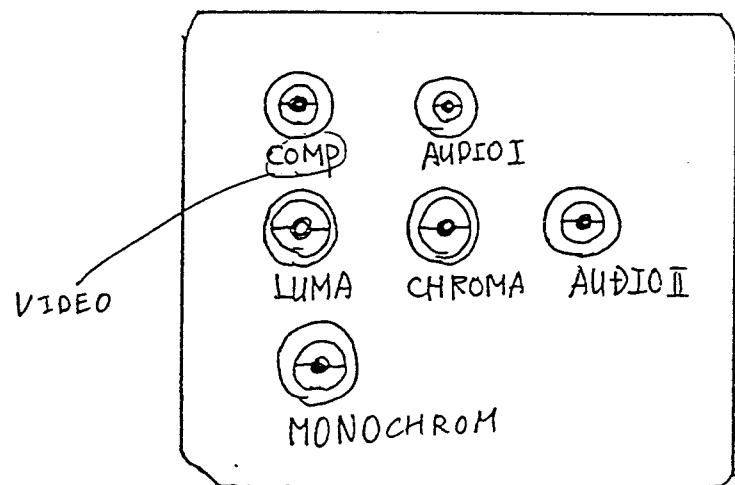
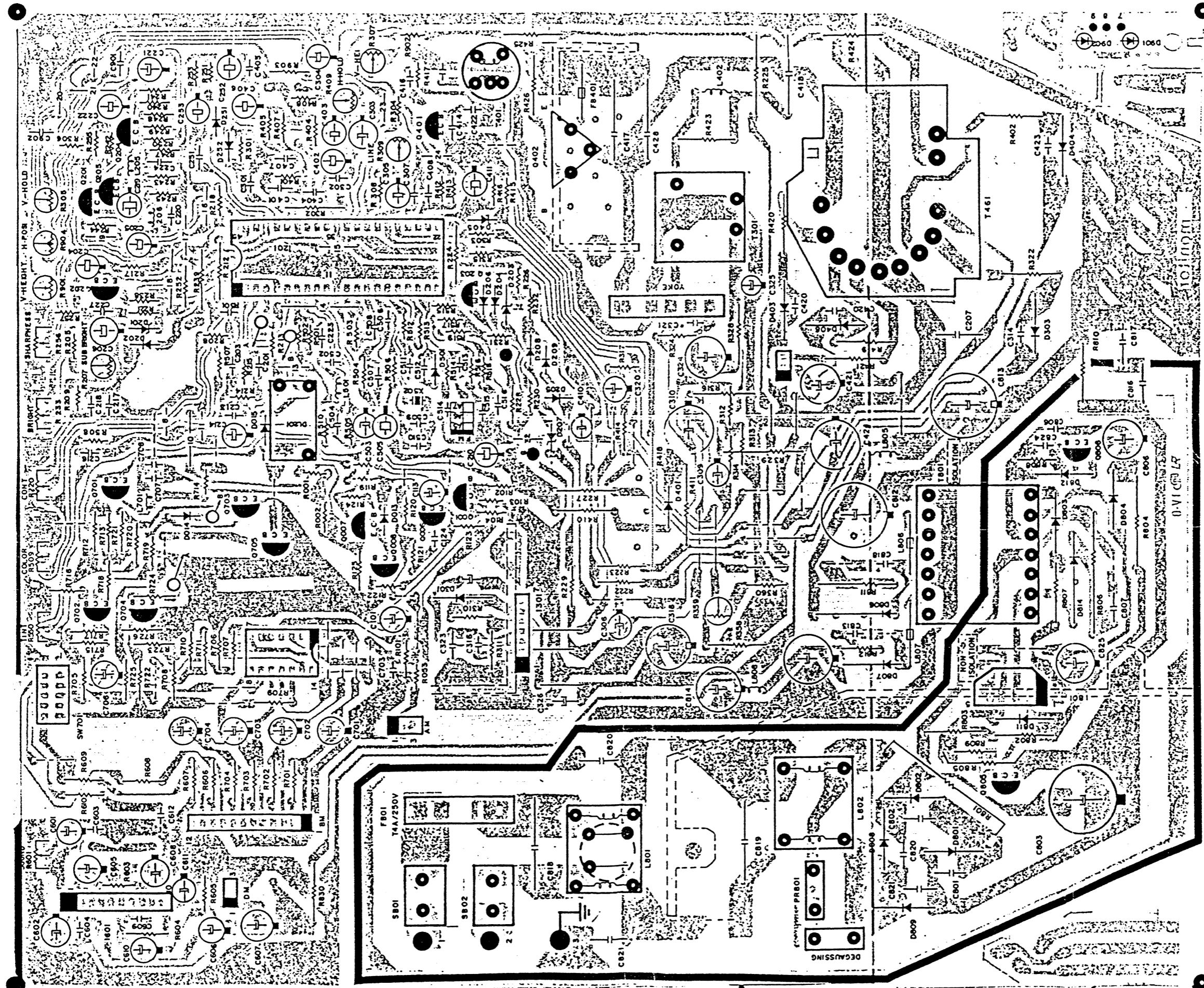


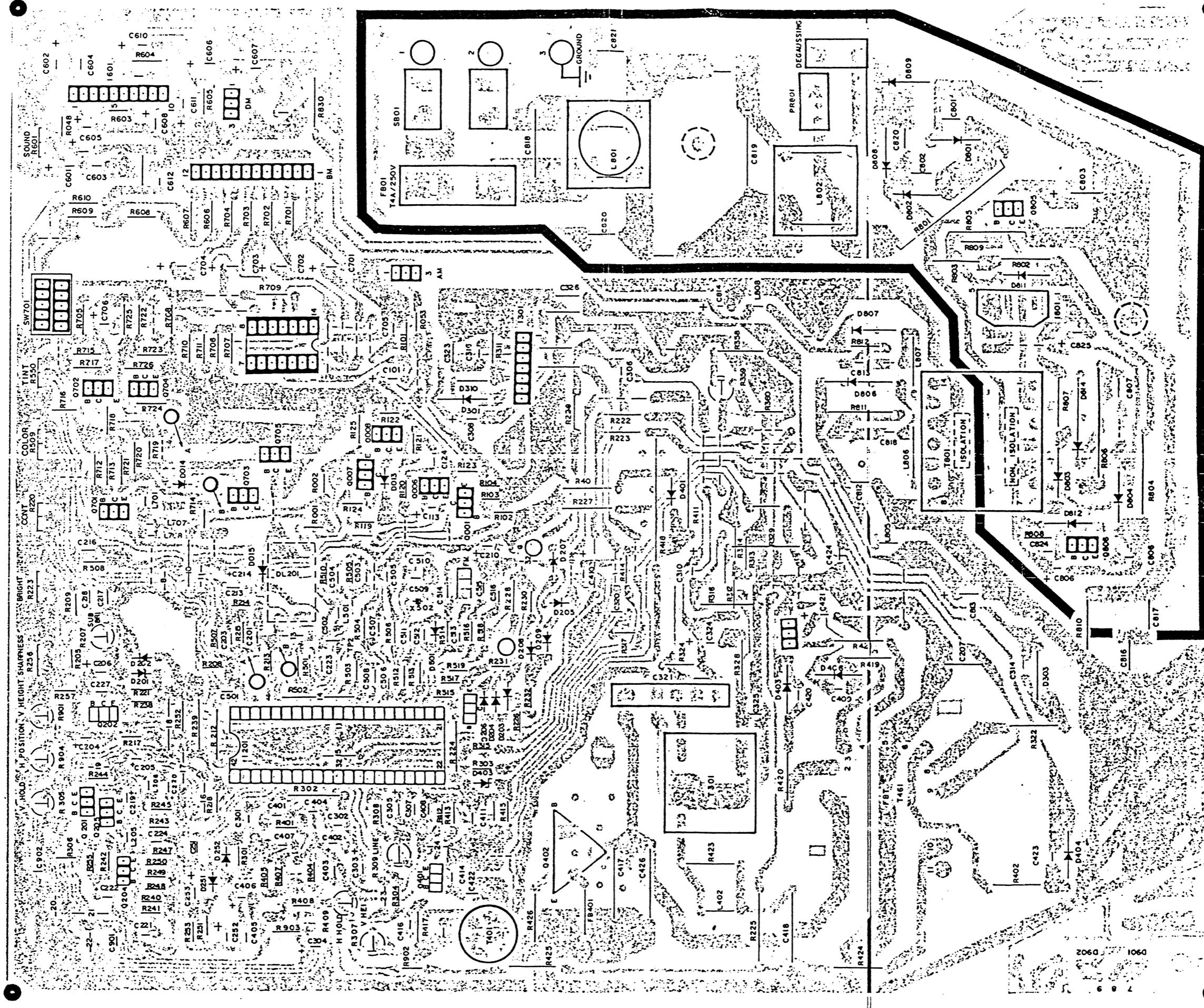
FIG 17

## TOP VIEW (component SIDE)

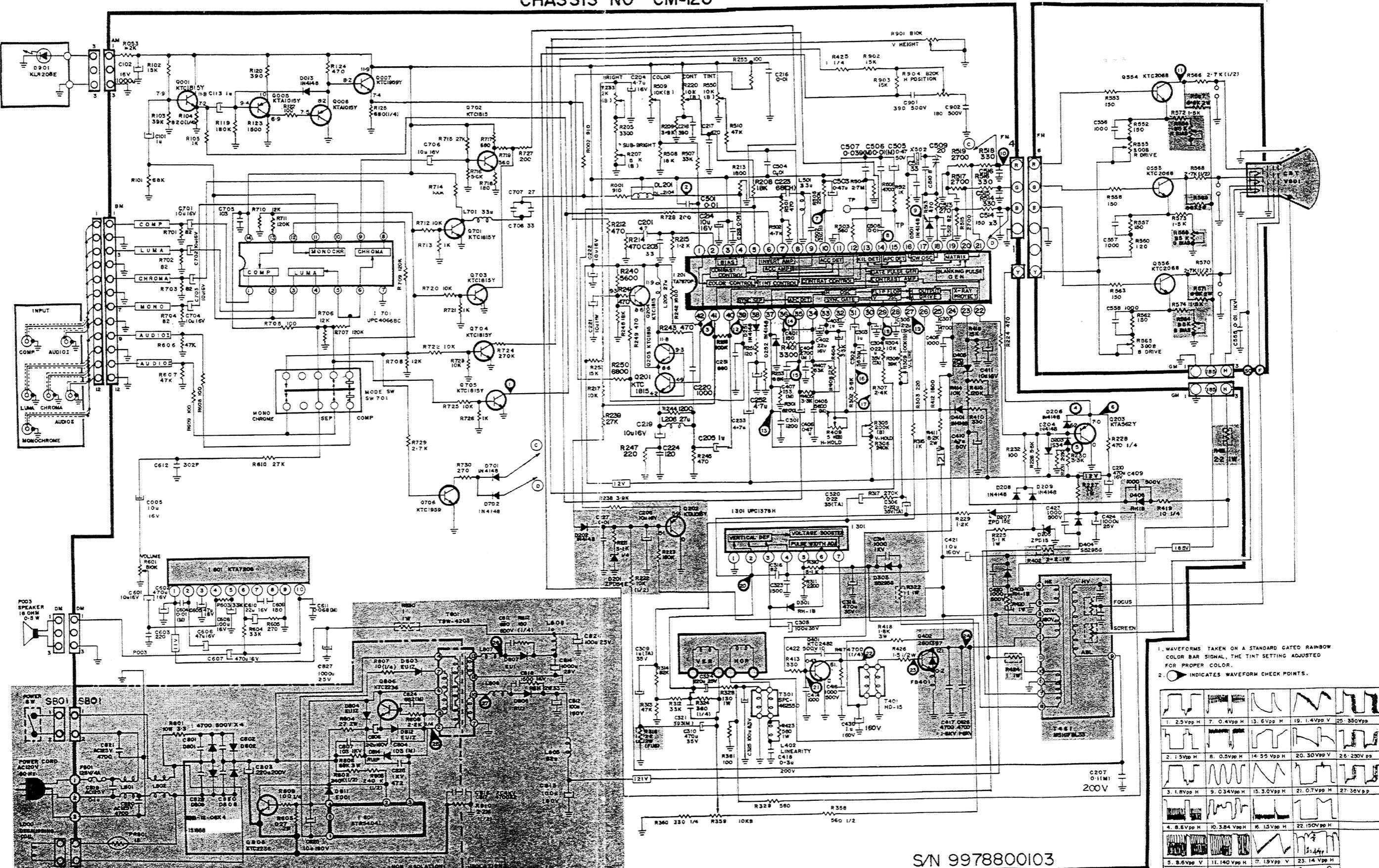
p.c. BOARD MAIN



TOP VIEW (Solder Side) p.c. BOARD MAIN



SCHEMATIC DIAGRAM  
CHASSIS NO CM-120



**NOTE**

NOTE:

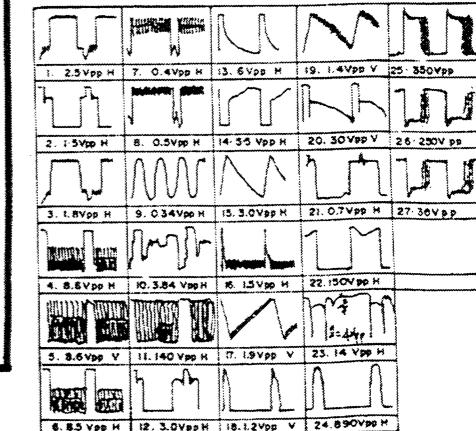
1. RESISTANCE IS SHOWN IN OHM.  $R = 1,000$ ,  $M = 1,000,000$ .
2. UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITOR VALUES LESS THAN 1 ARE EXPRESSED IN  $\mu$ FD AND THE VALUES MORE THAN 1 IN  $\mu$ F.
3. UNLESS OTHERWISE NOTED IN SCHEMATIC ALL INDUCTOR VALUES MORE THAN 1 ARE EXPRESSED IN  $\mu$ H AND THE VALUES LESS THAN 1 IN H.

4. VOLTAGES READ WITH "VTVM" FROM POINT INDICATED TO CHASSIS GROUND, USING A COLOR BAR SIGNAL WITH ALL CONTROLS AT NORMAL, LINE VOLTAGE 120 VOLTS AC
5. VOLTAGE READINGS SHOWN ARE NOMINAL VALUES AND MAY VARY  $\pm 20\%$  EXCEPT N.V.
6. THIS CIRCUIT DIAGRAM IS A STANDARD ONE, CIRCUITS PRINTED MAY BE SUBJECT TO CHANGE FOR PRODUCT IMPROVEMENT WITHOUT PRIOR NOTICE

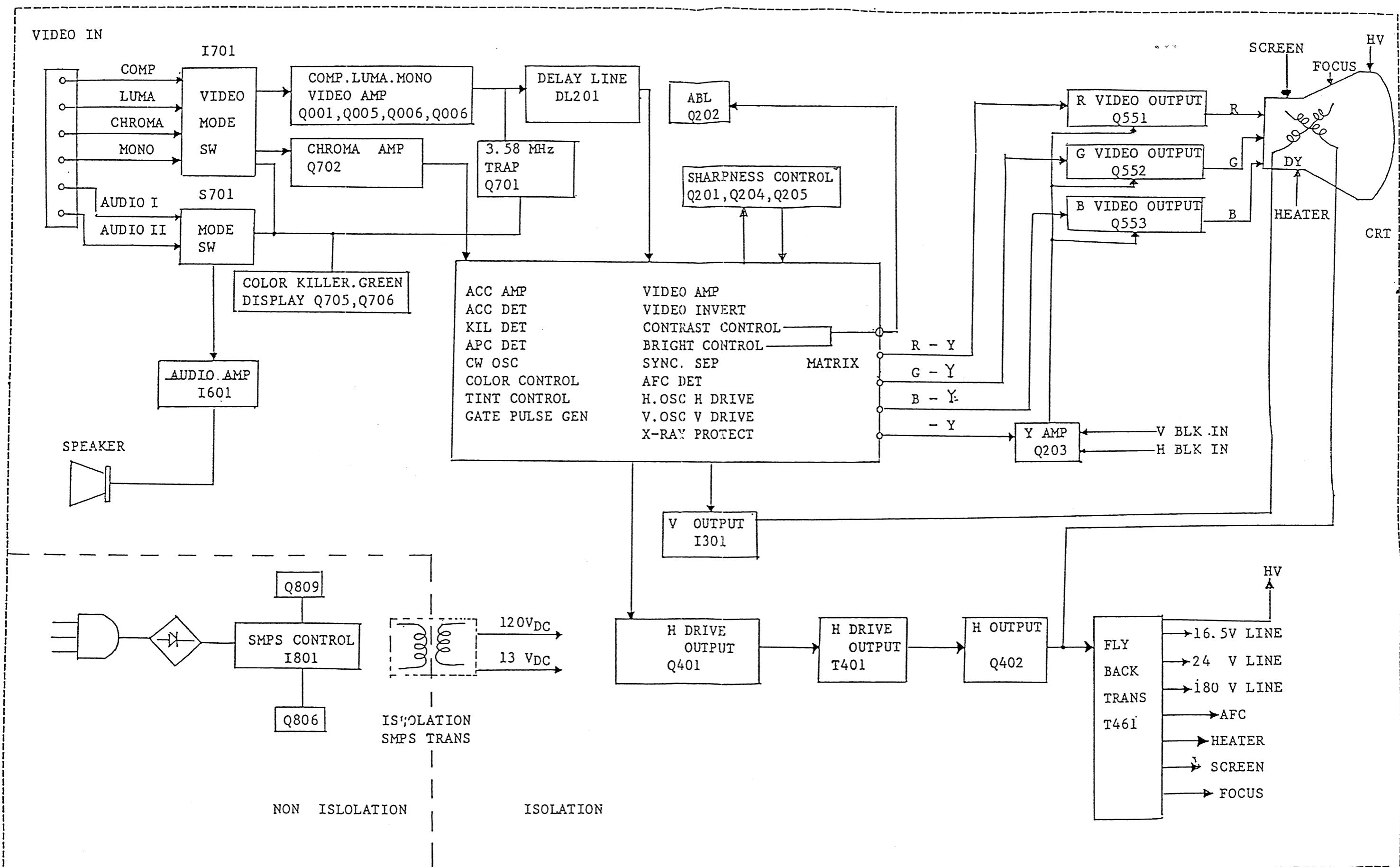
CAUTION - TO THE SERVICE TECHNICIANS;  
BEFORE RETURNING THE RECEIVER TO THE CUSTOMER,  
TO MAKE APPROPRIATE LEAKAGE CURRENT OR RESISTANCE  
MEASUREMENTS TO DETERMINE THAT EXPOSED PARTS  
ARE PROPERLY INSULATED FROM THE SUPPLY CIRCUIT

"WARNING"  
BEFORE SERVICING THIS CHASSIS, READ THE  
"X-RAY RADIATION PRECAUTION", SAFETY PRECAUTION  
AND "PRODUCT SAFETY NOTICE" IN THE SERVICE MANUAL.

**CAUTION:** THE SHAPED AREAS IN THE SCHEMATIC  
SHEET ARE DESIGNATED COMPONENTS WHICH HAVE  
SPECIAL CHARACTERISTICS IMPORTANT IN THE CIRCUIT  
AND SHOULD BE REPLACED ONLY WITH TYPES  
ANALOGICAL TO THOSE IN THE ORIGINAL CIRCUIT  
OR SPECIFIED IN THE PARTS LIST.  
DO NOT SUBSTITUTE EQUIVALENTS  
DO NOT DEGRADE THE SAFETY OF THE RECEIVER  
FOR GOOD IMPROVED SERVICE.



## B L O C K                    D I A G R A M



## REPLACEMENT PARTS LIST

SAFETY NOTE - Components marked with a "\*" have special characteristics important safety Notice on page of this service manual components marked with a "+" are related to the X ray protection circuit.

## PICTURE TUBE

I.D. Number	Stock Number	Description
(+)* V901	4859602040	370DJB22-TC17(Y)
ICS, TRANSISTORS, Diodes		
I301	Iupc1378	upc1378
(+)* I501	ITA7670	TA7670
I601	IKTA7208	KTA7208
I701	ITC4066	TC4066
* I801	ISTR54041	STR54041
Q001	TKTC1815Y	KTC1815Y
Q005	TKTA1015Y	KTA1015Y
Q006	TKTA1015Y	KTA1015Y
Q007	TKTC1959	KTC1959
Q201	TKTC1815Y	KTC1815Y
Q202	TKTA1015Y	KTA1015Y
Q203	TKTA562Y	KTA562Y
Q204	TKTC1815Y	KTC1815Y
Q205	TKTC1815	KTC1815Y
Q401	TKTC2482	KTC2482
Q402	T2SD1397	2SD1397
Q701	TKTC1815Y	KTC1815Y
Q702	TKTC1815Y	KTC1815Y
Q703	TKTC1815Y	KTC1815Y
Q704	TKTC1815Y	KTC1815Y
Q705	TKTC1815Y	KTC1815Y
Q70C	TKTC1815Y	KTC1815Y

I.D. Number	Stock Number	Description
Q554	TKTC2068	KTC2068
Q555	TKTC2068	KTC2068
Q556	TKTC2068	KTC2068
Q805	TKTC2229	KTC2229
Q806	TKTC2229	KTC2229
D013	DIN4148	IN4148
D201	DZPD5RE	ZPD5. 1E
D202	DIN4148	IN4148
D203	DIS34	IS34
D204	DIN4148	IN4148
D205	DZPD15E	ZPD15
D206	DIN4148	IN4148
D207	DZPD15E	ZPD15E
D208	DIN4148	IN4148
D209	DIN4148	IN4148
D251	DIN4148	IN4148
D252	DIN4148	IN4148
D301	DRH-1	RH-1
D303	DS52995G	S5295G
D401	DIN4148	IN4148
D403	DRH-1	RH-1
D404	DS5295G	S5295G
D405	DZPD22E	ZPD22
D501	DIN4148	IN4148
D701	DIN4148	IN4148
D702	DIN4148	IN4148
D801	DIS1888	IS1888
D802	DIS1888	IS1888
D803	DEUIZ	EUIZ

I.D. Number	Stock Number	Description
D804	DEU1Z	EUIZ
D806	DRU2	RU2
D807	DEUI	EUI
D808	DIS1888	IS1888
D809	DIS1888	IS1888
D811	DEG01	EG01
D812	DEU1Z	EUIZ
D814	DRUIP	RUIP

#### COILS AND TRANSFORMER'S

L401	58H0000005	L-51
L801	5PTLF472	FILTER LINE TLF472
L802	5PLF3544	FILTER LINE LF3544
L806	58C0000026	HC-4035
L807	58C0000026	HC-4035
FB401	58C0000026	HC-4035
LD00	58G0000020	COIL DEGAUSSING HD-2074C
*T301	5TCU000006	TRANS PIN CUSHION SPC 462550
*T401	5TDU00008	TRANS H DRIVE HD-15
(+)*T461	5TH0000050	TRANS FLYBACK MSHIFBL33
*T801	5TSW000007	TRANS SWITCHING TSW-4203

#### CONTROLS

R207	RV5417472	R Semifixed 5KB Sub Bright
R220	551202020B	VR ROTARY, 10K OHMB, CONTRAST
R233	551202011B	VR ROTARY, 2 K OHMB, BRIGHT
R305	551204013B	R Semifixed 200K OHMB, V-HOLD
R309	RV5417104-	R Semifixed 100K OHMB, V-LINEARITY

I.D. Number	Stock Number	Description
R359	RV5417103-	R Semifixed 10K OHMB V-CENTER
R409	RV5417502-	R Semifixed 5K OHMB H-HOLD
R509	551202020B	VR Rotary 10K OHMB COLOR
R550	551202020B	VR Rotary 10K OHMB TINT
R601	551202020B	VR Rotary 10K OHMB VOLUME
R901	RV5417103-	R Semifixed 10K OHMB V-HEIGHT
R904	RV5417203-	R Semifixed 20K OHMB H-POSITION

#### R E S I S T O R S

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R227	RS01F330J-	R M-OXIDE, 1W 33 OHM
R316	RF01F229J-	R FUSIBLE, 1W 2.2 OHM
R322	RF01F109J-	R FUSIBLE, 1W 1
R420	RF01F109J-	R FUSIBLE, 1W 1
R421	RF01F229J-	R FUSIBLE, 1W 1
R424	RF01F109J-	R FUSIBLE, 1W 1
(+)* R414	RD-6Z103J-	R Carbon Film 1/6W 10K OHM
(+)* R415	RD-6Z124J-	R Carbon Film 1/6W 120K OHM
(+)* R416	RD-6Z153J-	R Carbon Film 1/6W 15K OHM
(+)* R419	RD-4Z100J-	R Carbon Film 1/4W 10 OHM
R328	RS01F561J-	RM-Oxide 1W 560 OHM
R411	RS02F822J-	RM-Oxide 2W 8.2K OHM
R418	RS03F182J-	RM-Oxide 3W 1.8K OHM
R804	RS02F270J-	RM-Oxide 2W 27 OHM
R805	RS02F278J-	RM-Oxide 2W 0.27 OHM
R806	RS03F683J-	RM-Oxide 3W 68K OHM
R807	RS02F330J-	RM-Oxide 2W 33 OHM
R810	RD-2Z225J-	R Carbon Film 1/2W 2.2M OHM

## C A P A C I T O R S

I.D. Number	Stock Number	Description
C314	CCXB2H102K	C-CERA 500 V 102PF
C409	CCXB2H102K	C-CERA 500 V 102PF
C420	CCXB2H102K	C-CERA 500 V 102PF
C423	CCXB2H102K	C-CERA 500 V 102PF
C424	CCXB2H102K	C-CERA 500 V 102PF
C417	CMXH3C392J	C-MYLAR 1.6KV 392PF
C426	CMXH3C562J	C-MYLAR 1.6KV 562PF
C418	CMDN27304K	C-MYLAR 200 V 0.3uF
C422	CCSL2H100C	C-CERA 500 V 10pF
C812	CEXE2C101A	C-ELECTRO 160 V 100 M
C813	CEXE2C101A	C-ELECTRO 160 V 100 M